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THE new mining regulations of the Transvaal, while somewhat repugnant to Americans, who dislike Government interference with what they consider private affairs, have many good features. The returns will not only show the number of tons mined and milled, but the assays and quantities of the tailings and concentrates, as well as the yield from them. The standard ton will now be of 2,000 lbs., instead of 2,000 or 2,240 lbs., as the mine manager saw fit. This uniformity will enable the average yield to be accurately estimated; but it is much to be regretted that the metric ton had not been adopted, as it ultimately will be everywhere. The figures compiled by the Government and the Witwatersrand Chamber of Mines will be of the utmost statistical value, and an example well worthy of imitation in our own country.

It is safe to say that if the stockholders of many of our companies knew what low percentages were being saved at their reduction works, an instant reform would be made. To illustrate how loosely losses are calculated, and how prone some managers are to self-deception, the work at a Mexican mine may be instanced. The ore is chiefly mispickel with the silver combined with the pyrites, or in the form of pyrargyrite or proustite. In roasting, this ore loses some 20 to 25 per cent. in weight. The loss of silver in roasting, and there is a considerable one, is calculated by the difference in assay value of the raw and roasted ore, with an allowance made for the salt added. That is to say, if the raw ore assayed 100 ounces and the roasted 90 ounces, the loss is calculated as 10 per cent.; whereas, allowing for a loss in weight of 20 per cent., the actual loss is 28 per cent. Yet the manager, with considerable complacency, compared his reduced losses with those of a metallurgist who calculated his own correctly.

The superintendent of a Western mine which contained bunches of high grade but rebellious ore, on being questioned as to how it amalgamated, confessed frankly enough that it worked poorly alone, but when it was mixed with the low grade ore the loss was not noticed! So long as the value of tailings was not appreciably increased everything seems to them to be satisfactory. The most peculiar thing of all was that these men were not unintelligent, they had simply determined to blind themselves and employers to the actual results.

THE wisely liberal policy of the Mexican Government, so frequently displayed in its method of inviting the investment of capital within its bounds, has received a new demonstration in a late ruling of the Department of Foreign Relations.

The recent abrogation of the old mining code and the enactment of new regulations have occasioned much animadversion, for it was presumed that the change from the old well known laws, under the protection of which much capital had been invested, to the new code, the provisions of which, however well digested by legislators, were but dimly comprehended by the mass of the people interested, would lead to some confusion and litigation. But, fortunately for investors, and equally fortunate for Mexico, its administration is showing throughout this transitional period a very liberal and conciliatory policy in interpreting the law. A better illustration of this fact cannot be found than in a recent ruling on the granting of mineral claims to foreigners.

Regarding the right of foreigners to acquire mining claims, Article 6 of the Mining Code of 1884 said: "Foreigners can acquire mining property on the same terms and with the restrictions with which the laws of the Republic consider them capable of acquiring, possessing and transferring common property; submitting themselves, like Mexicans, to the prescriptions of this law and to any others which may be made relating to the mining industry." But underlying this law were those of February 1st, 1856, and May 28th, 1886, the former concerning the acquisition of Mexican properties by foreigners and the latter on foreign citizenship and naturalization. The important point of these laws is to the effect that foreigners before acquiring the possession of real estate must solicit and obtain permission to acquire such property.

The new mining law of June 4th, 1892, does not establish any restrictions as to the acquirement of mining properties by foreigners. It does, however, provide that, in order to obtain a title to a mine, application must be made within 90 days, and no provision is made for the extension of this time. It can easily be seen that under certain circumstances the title to a mine might be lost through the impossibility of making these applications within the time required. This view was presented to the Department of Foreign Relations, and at the same time the issue was raised: Does the law of June 4th abrogate the law of 1856, as well as the Mining Code of 1884?

The decision of the Department is to the effect that the law of 1856, being a special one, could not be considered abrogated by the Mining Law of 1892, which was general in character; but that when a foreigner presents an application for a mining concession he can, at the same time, send an application to acquire such property, through the respective governor, to the Department of Promotion.

At first view this might seem an unfavorable decision, but we cannot so regard it. The fact that the two applications can be made at

the same time relieves the provision of the old law of all hardship, and this, when obtained, cannot fail to act as an additional safeguard to the ownership of the property acquired.

LABOR AND ORGANIZATION.

In the light of the observations made in preceding articles, it will perhaps now be possible to indicate intelligibly my conception as to the true sphere of "organized labor."

A few weeks ago the editor of a leading religious and literary weekly, summing up the Homestead case with an evident attempt at fairness albeit at that kind of fairness which is sometimes the worst injustice, to wit, the assumption that both sides are in the wrong, declared that the Carnegie company was to blame for trying to break up a labor union, because a labor union was a good thing! Such a proposition from such a source is a striking indication of the extent to which honest people are misled on this subject by sympathy, tradition and delusive analogy. It is not very long ago that the refusal to give money to street beggars was generally considered a typical act of selfish indifference; and the notion lingers in sentimental literature still. But a more healthy common sense has at last brought Christian people to understand that the street beggar is a professional liar, plying a profitable trade; and the more piteous his tale of woe the greater their indignation at his impudent hypocrisy. But it is still possible to deceive the philanthropic with regard to the "wrongs of labor," and to win their sympathy for utterly unrighteous schemes by invoking names which have been associated with genuine efforts for worthy ends. In the instance I have cited, the notion that the Carnegie company, by simply failing to agree on a bargain with a given association of men, and thereupon resolving to bargain with somebody else, was guilty of trying to "break down" the association, is ludicrous enough. But the further proposition that this was a naughty act, because "a labor union is a good thing," is a blunder too deep for laughter.

In truth, the organizations of labor, like all other human organizations, are neither good nor bad, *per se*. Organization has no moral quality. It is simply power, and it may be used for good or evil. A disciplined army defending its country is a noble exhibition of power; an organized band of highway robbers is a monstrosity, the more hideous the more widely and thoroughly it has become organized. A church is a good thing; but the Mormon church was a bad one. An organization may be good to begin with, and become corrupted afterward; or it may pretend to be good and pursue the vilest ends. Indeed, associations for evil purposes always make such professions of virtue. The Mollie Maguires of Pennsylvania carried on the business of murder, arson and robbery as the benevolent Order of Ancient Hibernians, devoted to the succor of widows and orphans. The recent criminal trials in Idaho have shown that the secret oath of the Miners' Union is copied from that of the Mollie Maguires, and that the spirit of that association of assassins was to a considerable extent (as were some of its fugitive members) absorbed by the body which has so long tyrannized the mining districts of Montana and Idaho. The army and the courts have recently done a good deal toward "breaking down" that "labor union;" and I do not think the aroused public sentiment of that region will permit the course of justice to be checked by the assertion that such a union is a good thing and ought not to be discouraged.

Organization is simply power, and good or bad according to its activity. It is more dangerous to society than individual power, because it is so much greater, and yet so much less directly responsible to law. Hence the necessity of special statutes regulating its operations. But no agency has ever been rejected by civilization because it was dangerous. Dynamite and electricity are dangerous; but we shall not give them up on that account.

With regard to our labor unions in particular, I not only admit freely, but assert with emphasis, the right of their members to combine, and to act in combination, whether foolishly or wisely, just as they see fit, so long as they do not break the peace, or infringe upon the rights of other men. I desire to see no laws hindering such combinations; but, on the other hand, I think it both unjust and dangerous to except them from the wholesome laws which control other combinations of individuals in the interest of justice and order. In such an atmosphere of freedom and responsibility let them work out their own problems of policy. The following suggestions as to what, according to my observation of certain industries, the labor unions can profitably do, are therefore by no means intended as recommendations that they should be confined by law to these functions:

I may divide these organizations into three classes: The union composed of the employés of a single establishment only; the union which represents more than one establishment, but only one trade; and the union which represents many trades. The latter class is in the main a useless nuisance. The thing called "labor," which it professes to represent, does not exist as a separate element in the community; the various interests which constitute its sub-divisions are not harmonious, and cannot be advan-

tageously promoted by the meddling supervision of a superior body; the grand conflicts which it occasionally calls forth are usually trivial or unjustifiable in origin and disastrous in result. Unions of the second class, or "trade unions" proper, are on the contrary, capable of great usefulness, and will probably always be the most general form of labor organization. Unions of the first class (except when mere subordinate parts of larger trade-unions) are likely to be hereafter, as they are now, principally confined to those establishments which, by reason of special conditions, are able to make peculiar contracts with employés. Under such circumstances, the employés of a given concern, as part owners or profit-sharers, or what not, have an interest not shared by wage-workers, even in a similar business, outside. They constitute a trade by themselves, and form their own trade-union.

I shall consider here only the second class of unions; and my conception of the best type of that class is that of a large organization, in which smaller bodies, each representing a single establishment, are confederated. Such an organization, I think, could be most useful in the following way:

1. Benefits and Insurance.—Many large corporations and firms now administer systems of this class, and probably they do it better, in some respects, than voluntary associations of workmen. But the great drawback is that the benefits of such a fund are available to the workmen only so long as he remains in the employ of the company. Provision for old age is scarcely possible under such a system. The remedy of state socialism, as applied in Germany at the present time, I earnestly hope we shall not adopt. A much better way, it seems to me, would be the more thorough performance of this function by the trade-unions. Some of them do it now, and do it well; others do it very badly, and scarcely any of them give it the primary importance it deserves. When they do, they will be willing to have their operations and funds inspected, like those of other insurance companies, by public officers.

2. Support of Members in Legal Claims.—There is every reason for the effective support of a workman in any claim upon his employer, which he might fail to enforce, if unassisted, simply for lack of means to carry on the legal contest. The union to which he belongs may rightfully help him in that way, though it may not be justified in many measures, such as are now resorted to. What is or what is not justifiable in such cases depends upon the individual contract and the general principle of respecting the rights of others.

3. Improvement in the Skill of Individuals and in the Methods and Apparatus of the Particular Trade.—This seems to be entirely neglected by our labor unions, at least by those of them the proceedings of which get into the newspapers. I hear of no debates among them as to the best way of turning out the best work. On the contrary, there is a good deal of denunciation of improved devices. Even those which are intended to promote the safety of workmen are often opposed, on the ground that when the work has been made safer there may be a reduction of the high pay previously given on account of its extra hazardous character.

4. Agreements as to Wages.—As I have observed in former articles, a trade-union may act as a labor-agency, and make such contracts with employers as both parties may freely choose to make. But if it undertakes to do that sort of corporate business, it should be more responsible than it now is for the performance of its own agreements. Whether it will succeed in the business will depend on its fidelity to its engagements and the quality of the workmen it furnishes. I assume, of course, that it will not be allowed to use with impunity illegal means of coercing its customers to trade with it. Apart from such means, the trade-union will always suffer from the competition of non-union workmen. The most skillful men will always find that they can do better by pushing their own way; and if the trade-union wishes to retain the great advantage of the membership of such men in other ways, it must do two things: make its benefits attractive to them; and leave them free to work when, for whom, for what length of time and at what rate they choose. Otherwise, the union will be merely a league of mediocrity, and, as such, scarcely able to compete with the better labor outside of it. Some unions, by earnest attention to the points of character and skill in their membership, have already achieved a valuable business reputation in this respect. Employers like to bargain with them. But many more have neglected this matter altogether, relying on direct or indirect intimidation to force the business patronage which they do not deserve. The result is a very general substitution of shirkmen for workmen. Let the free laborer have a chance again; and let the union stand on its merits, not on his prostrate body!

R. W. R.

An Aluminum Yacht.—Messrs. Escher, Wyss & Co., of Zurich, have just finished building a yacht of aluminum which is three times larger than that recently exhibited at Frankfurt. Its length is 14 meters, equal to 45.7 ft., and it weighs, including machinery, but 1,500 kilos, or 3,312 lbs. The shaft is of steel and the propeller bronze. These parts, together with the masts and fittings, weigh 800 kilos, leaving the aluminum part but 700 kilos in weight. The hull retains the natural color of aluminum. The propelling power is naphtha and the yacht cost but \$4,400, it is said.

NEW PUBLICATIONS.

THE MISSOURI COAL MEASURES AND THE CONDITIONS OF THEIR DEPOSITION.—Arthur Winslow. Abstract from Bull. Geol. Soc. Am., Vol. 3, 1891. Published by the Mo. Geol. Survey, Jefferson City, Mo.; 8 figures.

As previously published in the Report of the Missouri Geological Survey, 1872, part II., the area of the Missouri coal measures comprises about 23,000 square miles, occupying the western and northwestern portion of the State. The altitude of this area varies from 600 to 1,300 ft. Along their eastern margin the coal measures are very thin, but thicken toward the west and northwest, so that in the extreme northwest part of the State they have a thickness of perhaps 2,400 ft. and include some 200 strata. The slope of the floor of the coal measures is about 10 feet to the mile.

The rocks are sandstones, shales and limestones, the sandstones being most abundant along the eastern margin; the shales, which predominate over the other two, are about equally distributed, while the limestones are more abundant in the interior or toward the northwest than on the eastern margin.

The coal is all bituminous with the exception of local beds that approximate cannel coal. The seams vary in thickness from one inch to about five feet, and are generally soft and sulphureous, with laminae of selenite. The roof is generally of black shale, frequently fissile (sometimes a gray or drab shale appears), less frequently of sandstone, or limestone separated from the coal by a narrow band of clay or shale. The bottom is almost invariably clay.

The coal measures are not persistent either in thickness or material, especially among the lower rocks, and this condition of affairs embarrasses mining operations to some extent. Mr. Winslow thinks that the Ozark uplift, which contains some 15,000 square miles and occupies the southern and southeastern part of the State, south of the Missouri River, the Ozark Mountains being the most distinguishing feature of it, was due to movements originating in Silurian times, even Lower Silurian, and that these movements "were consequent upon the deposition of the great mass of Lower Silurian strata in the sea surrounding the Archean Archipelago." He adduces weighty reasons in support of this view, and the reader is referred to the original paper for the very interesting argument by which he sustains his position.

THE MAPPING OF MISSOURI. BY Arthur Winslow, assisted by C. F. Marbut. Transactions of the Academy of Sciences of St. Louis. Vol. VI., No. 3; pp. 57-99, 14 sketch maps and 1 colored map.

The first geological survey of Missouri was begun in 1853, by G. C. Swallow, and continued by him till 1861. The work then lapsed till 1870 when it was taken up by Messrs. A. D. Hager, Raphael Pumpelly and G. C. Broadhead, in succession, and continued till 1875. It then suffered another relapse until 1889, when the present State Geologist, Arthur Winslow, assumed the position he still occupies. The first and second surveys seem to have been fruitful of but little original geographic work, for, with the exception of the topographic map of Pilot Knob, and the contiguous district, on a scale of 1,200 feet to the inch, prepared under Pumpelly, and the contour map of the Granby mining district, on a scale of 200 ft. to the inch, prepared under Broadhead, the valuable contributions to the geography of Missouri are but few. The present survey is devoting considerable attention to this important subject, as it surveyed and platted ten sheets, each of an area of 228 to 240 sq. miles, in 1890 and 1891, and the work is still in progress. These sheets are platted on a scale of about 1 mile to the inch or 1-62,500, and show the topography, geology, hypsometry and cultural features. The sketch maps included in the paper are reproductions of Zaltieri, 1566; Mercator, 1569; De Witt, 1670; Joliet, 1674; Franquelin's "Great Map," 1684; Franquelin's "Third Map," 1688; Sinex's, 1710; Lieut. Ross, 1765-1775; Winterbotham's, 1795; Lewis & Clarke, 1804 to 1806; Pike, 1810; Long, 1820; and the Warren, 1857.

The U. S. Coast and Geodetic Survey measured its first base line in the Missouri bottoms in 1871, and the triangulation, followed by a line of accurate levels, has been extended across the State into Kansas.

The Mississippi River Commission, organized in 1879, began work when only some 18 miles of the river below Cairo had been mapped. Since then it has published 10 sheets from Cairo to the southern boundary of Missouri, and 14 sheets from Cairo to Carondelet. The published maps of this Commission are on two scales, the one for the purposes of navigation, 31 inches to the mile, the other for general purposes, 1 inch to the mile.

The Missouri River Commission began work in 1878, and has published one series of maps, 1 inch to the mile, but they contain less detail than the maps of the Mississippi River Commission.

The United States Geological Survey began its mapping work in Missouri in 1884. It has published, so far, 25 sheets on Missouri, and 5 sheets on portions of Missouri and Kansas, all on a scale of 1-125,000, or about 2 miles to the inch, with a contour interval of 50 ft. In addition it has published 2 sheets, including St. Louis and parts of St. Louis County and Illinois, on a scale of 1-62,500, or about 1 mile to the inch, with contour intervals of 20 ft. The publication of this paper is timely, and the matter it contains is of permanent value.

ANNUAL REPORT OF THE GEOLOGICAL SURVEY OF ARKANSAS FOR 1892. John C. Branner. Ph. D. State Geologist. Vol. I. The Iron Deposits of Arkansas. by R. A. F. Penrose, Jr., Ph. D. Little Rock. Press Printing Company. 1892; pp. 138 and index, map and four plates.

It is to be regretted that the careful work done by Dr. Penrose in the preparation of this report should not have led to a more encouraging result as concerns the future of the iron business in Arkansas. It is, however, not his fault that nature neglected to provide this State with iron ores in sufficient quantity and of sufficient quality for the manufacture of iron on a large scale. The faithfulness of his work is not impaired by the unpropitious natural conditions upon which it was based. He has cleared away the general haziness in which the possibilities of the manufacture of iron in Arkansas from Arkansas ores have been wrapped for many years, and, while the task must have been unpleasant (for we all like to give a good account of things, if possible), he has performed it in as delicate, and at the same time as thorough, a manner as could be desired.

This report is the first detailed description of the iron ores of

Arkansas, for the accounts given by Featherstonhaugh in 1835, Lesley in 1859, Owen in 1860, Harvey in 1886, Comstock in 1888, Call in 1889, and Williams in 1890, dealt with the subject generally or were confined to brief remarks on local deposits. Dr. Penrose classes the ores, by their geographical situation, under five heads: 1. Northeastern Arkansas. 2. Northwestern Arkansas. 3. The Arkansas Valley. 4. The Ouachita Mts. 5. Southern Arkansas. Geologically these ores are associated, in the order given, with Lower Silurian (probably calciferous) sandstones, cherts and limestones; Lower Silurian cherts, and Lower Carboniferous sandstones; Carboniferous and Lower Carboniferous rocks; Lower Silurian shales and novaculites, and at Magnet Cove with igneous rocks; sands and clays of the Eocene Tertiary. The only ores that could be worked at all, on a commercial scale, are those of Northeastern Arkansas, and a few in the Ouachita Mts., and in Southern Arkansas, and he says, "of these three regions, Northeastern Arkansas is the only one which offers favorable conditions for iron mining and manufacture, and, even there, the industry, if established, would be limited."

It is, of course, well to set a high standard of quality for iron ores, as a general rule, the higher the better, but it seems to us that Dr. Penrose says too much about Bessemer and too little about non-Bessemer ores. Of course if an ore is strictly Bessemer its value is enhanced, but the remarkable output of pig iron in the Southern States since 1880, amounting to over 4 million tons, would have been as nothing if the market had been limited to Bessemer stock. Again, it should not be forgotten that the uses to which non-Bessemer iron can be applied have been widely extended during the last ten years, not only by the Thomas but also by the basic open hearth process. The extension, especially as regards the Thomas process, has not been so marked in this country as abroad, yet the use of basic iron and steel shows a healthy and hopeful growth.

But this may not be apropos to the subject, since it seems doubtful if Arkansas can furnish enough iron from its own ores to be worked by any process, commercially. At the present time it produces neither iron ore nor pig iron.

CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

All letters should be addressed to the MANAGING EDITOR.

We do not hold ourselves responsible for the opinions expressed by correspondents.

The Nowell Gold Mining Company.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: Can you give me any information concerning the notorious Nowell Gold Mining Company, supposed to be operating in Alaska? J. L. New York, Oct. 8, 1892.

[From information which we have received, we learn that, although it is claimed that some \$60,000 have been taken out, not a dollar of this has been forwarded to Boston for the benefit of the stockholders, but Mr. T. S. Nowell, the head of the concern, is expending it in Alaska. He has purchased, we understand, the adjoining C. & C. claim for \$20,000; a two-thirds' interest in a water claim for \$8,000, and has built a saw mill costing \$10,000. Nowell claims that great savings will be made by these investments, but as yet it remains to be seen whether Nowell in reality is mining in Boston or in Alaska.—Ed. E. & M. J.]

The Cyanide Process at the Hillside Mine.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: In a note in your issue of October 1st, commenting upon a letter referring to the cyanide process, you state that the process had proved a failure at the Hillside Mine, Arizona. I would not quarrel with the statement if you had added that it had proved a failure at the Hillside when operated by the gentlemen who own the right of using the patents, and who wish to collect royalties on them. But that would not have been the whole story. The process was demonstrated a failure by the experiments conducted by the Yavapai Gold and Silver Mining Company (Prescott), and the Gold and Silver Extraction, Mining and Milling Company (Denver), but, at the same time, it has been proved a success when operated by ourselves at the mine. Numerous tests—in lots from 50 lbs. to 3,000 lbs.—have given us excellent results both as regards the extraction of the silver and the gold. T. A. RICKARD.

DENVER, Oct. 5, 1892.

The Silver King Mines.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: There seems to be some conflicting opinions about the status of the Silver King Mine, the ring controlling it and the strike made last winter in the 70-foot level.

Besides the output accounted for in the official report to the stockholders, there have been held back one carload of concentrates at Tempe since shipped. There are also sufficient concentrates on the way and ready for shipment to make another carload, making in all three carloads of concentrates won since the mill started and valued at \$500 a ton, or \$15,000, besides regular shipments of assorted ore, most of which have been accounted for in the reports except 150 sacks valued at \$500 a ton. Ore is still being taken out sacked and stored.

The mill was shut down on the 17th. There is plenty of ore in the 70-foot level. The open quarry is looking finely with plenty of ore in sight.

The reasons given for shutting down was the low price of silver; the real reason, however, appears to have been the freezing out of the New York stockholders in the interest of the favored few. There seems to be no doubt about the ability of the mine to pay dividends for some time to come, and making an assessment under these conditions has a peculiar appearance; it is even rumored that protests will be made against payment. F. F. McCAFFREY.

SILVER KING, Arizona, Sept. 26, 1892.

The Algoma Nickel Mines.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: The Worthington Mine, on which work was suspended last fall, has been started again this week, with Capt. Tom Roberts as foreman.

This mine is situated 25 miles from Sudbury, on the Sault Ste. Marie branch of the Canadian Pacific Railway, and is evidently one of the best properties in the district. A great deal of the ore taken out of the test shaft last year was shipped direct to the refineries in Swansea without having to be smelted here, as it carries from 20 to 30% of nickel in its native state. The other mines on the range average about 3% of nickel in the ore.

The smelting works on the Travers Mine have been completed and are in full operation now. The development work on this mine has disclosed a large body of high-grade ore near the surface. A tramway has been built from the mine to Worthington siding, a distance of 4 miles.

Some new discoveries made this season go to show that the main nickel range turns to the northwest about the middle of the township of Drury, running into Trill, and not southwest, as formerly supposed.

The growing demand for nickel matte and various other circumstances are causing some new interest and activity in mining here this fall, and there are more inquiries for nickel properties now from outside capitalists than for the past two years.

The ore in the Stoby mine was very low grade when first opened, but has greatly improved in quality on being worked into, and there is an immense body of it right on the surface, in the shape of an oblong hill. Over 100 tons a day is mined from a single adit in this mine now. In the Copper-cliff mine a bed of exceedingly rich ore was recently found in drifting on the fifth level.

Coke for smelting purposes is imported for the mines here from Ohio by boat to Algoma Mills, and then by rail 90 miles to the mines. The cost laid down at the furnaces is about \$7 a ton. One ton of coke reduces six to eight tons of ore.

A. McCHARLES.

WHITEFISH, Ont., October, 1892.

The Carson River Placer Mining and Dredging Company.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Can you afford me any information concerning the Carson River Placer Mining and Dredging Company, operating near Dayton, Lyon County, Nev.?

A. L.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: The Carson River Placer Mining and Dredging Company have not thus far made a success of the recovery of the precious metals and quicksilver supposed to be in the Carson River below the mills. They have been constantly changing their dredging machinery. They have tried several kinds of apparatus, as suction scoops and buckets. The trouble appears to be the variety of material in the bed of the river. There are encountered rocks of all sizes, from those of a few pounds up to huge boulders. Apparatus that will raise one kind of material will do nothing with the others. Were the material graded to a size—all sand, all cobblestones or all boulders of a certain size—the proper kind of apparatus might be selected to handle it, but it is a heterogeneous mass of river drift.

Rocks occur that cannot be lifted by suction and which break the buckets of other dredging machinery. Thus far—in all the years they have been at work—the company have done little but make experiments with various kinds of dredging apparatus. Also they have several times altered their sluices and apparatus for securing the amalgam, free gold, sulphurets and quicksilver. At first they arranged to do all the washing, etc., on the scow, but finally carried it ashore in sluices for amalgamation; though thus far they have had very little to amalgamate.

Now they are going to make a new start, beginning at the very foundation with a new boat. They now announce that they intend putting in what is called a "clam-shell" dredger. The Bennett amalgamator is all right. It will be used in connection with the new dredge, provided anything shall be raised and sent ashore for it to be operated upon. J. H. Rae, Jr., the company's superintendent, will, in a few days, go over the mountains to look for material for the construction of the new boat. Thus you see the outlook is not very promising.

DAN DE QUILLE.

VIRGINIA CITY, Nev., Sept. 27, 1892.

[The above correspondence fully explains itself.—ED. E. & M. J.]

THE ELIMINATION OF SULPHUR FROM IRON.*

By J. E. Stead, Middlebrough.

In discussing this subject I propose chiefly to consider: 1. The sources whence sulphur is derived, which arrives eventually into our pig iron, and the attempts which have been made to remove it from such sources. 2. How it is that the sulphur finds its way into combination with iron in the blast furnace, and how it is removed in the same furnace and eventually finds its way into the slag. 3. To discuss the changes which are effected in the puddling and other processes depending on the action of oxide of iron in excess when sulphurous iron is operated on. 4. Sulphur elimination in the acid Bessemer converter and open hearth furnace. 5. Sulphur elimination in basic steel processes. 6. The elimination of sulphur by such processes as Heaton, Warner and others, all of which are based on the action of some alkaline salt upon molten iron. 7. The Massenez process of desulphurizing. 8. The most modern and recent discovery of Mr. Ernest Saniter.

SULPHUR IN THE MATERIAL.

Coke and Coal.—Sulphur exists in two conditions, naturally, in coal: 1st, in greatest proportion in pyrites; and 2d, in sulphate of lime. Some coals are free from the latter substance, but I have met with coal containing as much as 1 per cent., equal to 0.23 per cent. sulphur. During the process of coking, half of the sulphur is driven off from the pyrites, but that in the lime sulphate is all retained. It is, therefore, a disadvantage to have sulphate of lime in coal which is required for making furnace coke, but a decided advantage if the coal has to be burned in an open fire, or the fire grate of a steam boiler; for the sulphur present in the sulphate is retained in the ash, and none of it escapes into the atmosphere.

During the last twenty years the amount of sulphur, on an average, has been in best English coals gradually increasing. Twenty years ago the sulphur in best average Durham furnace coke used in the Cleveland district was not above 0.8 per cent.; and the furnace manager considered himself badly used if a coke containing 1 per cent. was

* Paper read before the Iron and Steel Institute, September 22d, 1892, and since revised by the author.

sent to his works. To-day the average used in Cleveland contains about 0.95 per cent. sulphur, and coke with 1.25 per cent. is often utilized. Crushing and washing the coal results in the removal of a very large proportion of the heavy pyrites, and many coals are now by that means so well cleansed as to give a coke well suited for furnace work, which, without washing, would have been utterly useless for that purpose.

The removal of sulphur from coal is effected therefore in only two ways: 1. By washing out the pyrites. 2. During the coking process.

Iron Ore.—The exceedingly low price of pig-iron, and the small profits derived from its manufacture, prohibit the use of expensive processes for the removal of sulphur from the ores. There are only two processes in general use, viz.: 1. The method used in America, and only applicable to magnetic ores containing pyrites—viz., the separation by magnetic machines. 2. By calcination.

By the first method mentioned it is necessary to crush the ore to fine powder, to pass it afterward through the magnetic machines, by which means not only are the pyrites separated, but all other substances (such as silica, phosphate of lime, etc.), which are not attracted by the magnet. The ore prepared in this way, of course, remains in fine powder, and is not in a condition such as we in England care to have it, for our experience with purple ore shows us that when used in large quantities it has a tendency to check the driving in the blast furnace, and that the furnace flues are soon filled with the powder, carried over mechanically with the gas. About twenty-two years ago a cargo of Marbella ore-sand was sent to the Wotton Park Works. The condition was exactly similar to magnet-cleaned ore. About 25 per cent. of this cargo was charged with 75 per cent. of good Spanish ore into a furnace 75 ft. high, working with blast at 3½-lbs. pressure. The result was not satisfactory; the blast refused to pass through the mass with any reasonable speed, and, as a consequence, the furnace was nearly "gobbed" up, and it was with the greatest difficulty that it was got into working order again after removing the cause of mischief. The blast in this case was certainly not great, and I can only account for the reported success in using crushed ore in American furnaces because the blast pressure is so much greater. We must not, however, forget that if one evil is reduced by increased blast pressure, the other is likely to be increased, and a correspondingly larger proportion of fine ore be carried into the flues.

Looking at the question from every point, I am of the opinion that if crushed ores freed from pyrites, etc., must be used, large dust-collectors should be attached to the "down comers," and our furnaces must be worked at greater pressure than is usual in this country to obtain satisfactory results.

Calcination is the most generally adopted method of removing sulphur from ore. At Colebrook, in America, the magnetic ore used in the furnaces is calcined in kilns heated by gas, by which means the sulphur originally present is reduced by 50 per cent. Purple ore bricks are an instance of the effect of repeated calcination, with free exposure to air, upon iron pyrites, which contains about: Iron, 45.0; sulphur, 50.0; copper, 2.5; silica, etc., 2.5; total, 100.0 per cent. The greater part of the sulphur is removed in the sulphur burner, where it combines with oxygen and passes into sulphurous acid (more correctly called sulphur di-oxide), and is eventually converted into sulphuric acid. When the burnt ore is "drawn," the whole of the original copper, together with 3 to 6 per cent. of sulphur, remains. In this condition it is sent to the copper works, where it is ground to powder, mixed with common salt, and calcined in a reverberatory furnace, in an oxidizing atmosphere, by which means the sulphides are oxidized to sulphates. By washing, the sulphates of copper and other soluble sulphates are removed, and the washed ore, containing 16 to 18 per cent. of water, 0.40 to 0.50 per cent. sulphur, and 0.08 per cent. copper constitutes ordinary purple ore or Blue Billy. The sulphur is further reduced to under 0.1 per cent. during the manufacture of bricks, in which, after molding to suitable shapes, they are baked in a brick kiln.

If the ores subjected to calcination contain carbonate of lime, its presence is liable to prevent the expulsion of the sulphur by calcination. Thus, in a careful observation made at Eston in calcining Cleveland ironstone which contained under 0.3 per cent. sulphur, the carbonate of lime present was decomposed, and the free lime absorbed the sulphur dioxide at first produced in the oxidizing atmosphere of the kiln; sulphate of lime was produced, but not only was no sulphur removed, but it was actually increased; the sulphur from the small coal used for calcining was to a certain extent retained by the lime of the ironstone. The practice of calcining ironstone and limestone together must result in the prevention of the escape of sulphur dioxide. Sulphates of baryta and lime, in fact, sulphur in every form charged into a blast furnace, is equally liable to be retained in the pig iron, for reasons which will be discussed hereafter. There is no method of removing such sulphates from the ore before smelting, excepting by dressing and hand picking, and this is only practical when the white sulphates are not diffused or mixed throughout the material.

(To be continued.)

The Duke of Portland's Model Village for Coal Miners.—A model village is being built for coal miners of the Bolsover colliery, near Chesterfield, England, by the Duke of Portland, at the suggestion of the prominent colliery owner, Emerson Bainbridge. The village consists of rows of small but comfortable brick cottages, built in an attractive style, with gardens and land for the cultivation of vegetables, etc., adjoining. The houses cost on an average £170 and the weekly rent to tenants will vary from 3s. 3d. to 3s. 9d. per week. In order to keep the men together very advantageous terms will be given to those who wish to purchase their homes. While not running the village on puritanical principles, the Duke will take care that the miners have no undesirable neighbors. The saloon will not be intrusted to a private individual, but at the same time the supervision of the moral welfare of the men will not be everdone. A savings bank is being formed, and also a "cow club" and a sick and accident club. A car line connects the colliery with the village, and transport to and from the work will be free; also, the men will have a ton of coal a month for their own use.

THE CYANIDE PROCESS IN SOUTH AFRICA.

Written for the Engineering and Mining Journal by Chas. Butters Ph B., and John Edward Clennell, B. Sc.

(Concluded from page 342.)

Precipitation of the Gold.—Having obtained a solution of gold in cyanide of potassium, the next step is to recover it. Various precipitants have been suggested, but the only one which has been practically successful on a large scale is metallic zinc, in the form of freshly-turned shavings. Zinc in sheets offers too little surface for the deposition. The same is true of granulated zinc. When once the surface has become coated with an extremely fine layer of gold, the action ceases, or becomes so slow that the precipitant cannot be practically applied in this form. Zinc-dust and zinc-amalgam have also been tried, and are effective in so far as they present a large surface for deposition, but are found to clog if the continued flow of liquid through them is interrupted. Sodium or potassium amalgam has been used with success on a small scale, as in the Molloy process, now about to be tried with a 500-ton plant at the Pioneer Gold Mining Company, but the difficulty so far has been to manufacture these substances cheaply and in sufficient quantity.

The zinc-shavings now in use are prepared by turning thin sheets of zinc on a lathe. This produces a light spongy mass, which readily allows the solution to filter through, and exposes a large surface for the precipitation of the gold. These shavings are placed in wooden troughs, commonly known as "zinc-boxes," and the solution from the leaching vats is allowed to flow slowly through them, depositing the gold as a finely-divided black slime on the surface of the zinc, while the zinc gradually dissolves in the liquid. After passing the zinc box, the "exhausted solution," which

The total amount of zinc consumed amounts to about 100 lbs. a day. Two men are constantly employed at the lathes, so that the turning is an arduous and somewhat costly operation. It is desirable to use freshly-turned zinc, as the surface rapidly oxidizes and becomes much less active in precipitating the gold.

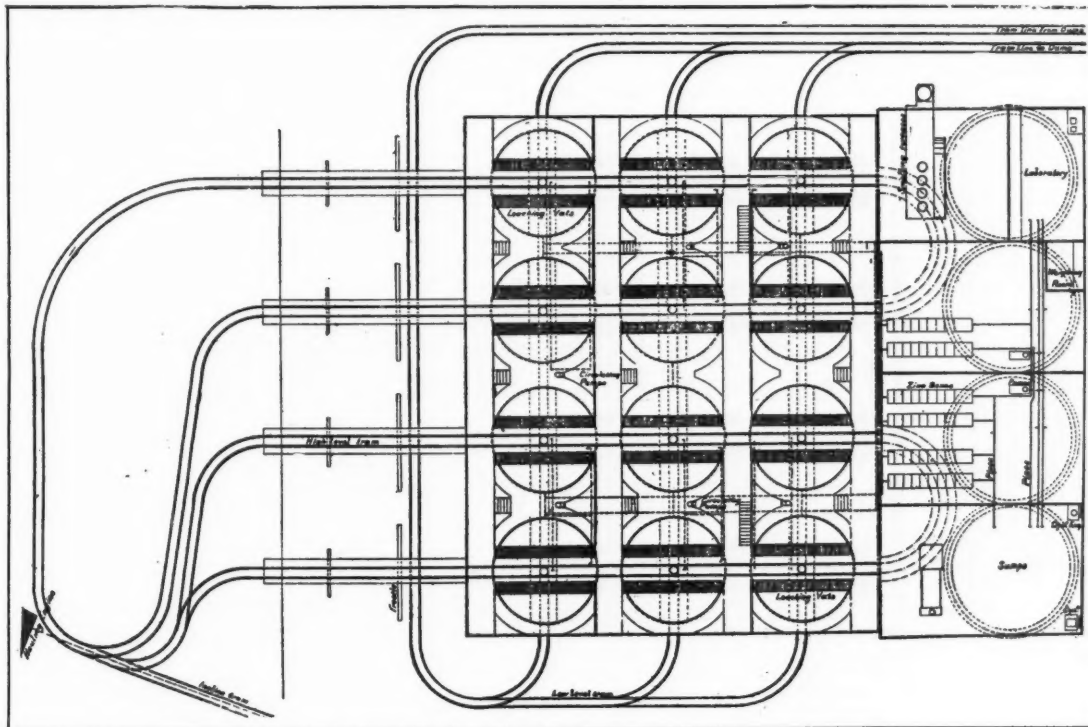
The most vigorous action of course takes place in the compartments which first receive the solution from the tanks. It is here that the zinc dissolves most rapidly, and is accordingly replaced by shavings from the lower compartments, while fresh zinc is continually added as the last compartment becomes empty.

The clean-up takes place once or twice a month. The screens containing the undissolved shavings are lifted from the zinc-boxes. The boxes are then left undisturbed for an hour so as to allow the zinc-gold slime to settle at the bottom. The liquid is then drawn off by a siphon until very little is left above the slimes. The box is then cleaned out, and the slimes and muddy water allowed to drain through a screen of 40 meshes to the inch. The mass, consisting of water, finely-divided gold and very fine zinc, is rubbed through this screen by means of a short stick 5 or 6 in. in length, to the end of which is fixed a piece of india rubber.

The stuff remaining on the screen consists almost entirely of unconsumed zinc, fine enough to pass through a screen of 12 meshes to the linear inch. This is replaced in the first divisions of the zinc-boxes over a fresh lot of shavings.

The slime, consisting of finely-divided gold and silver, with a large proportion of zinc and lead, and a certain quantity of tin, antimony, organic matter and other accidental impurities, is allowed to settle in a small tank placed beneath the 40-mesh screen, and is now ready to undergo the drying and smelting operations necessary for its conversion into bullion.

In the Molloy process to which we have alluded above, the use of zinc



CYANIDE PLANT—GROUND PLAN.

should not contain more than $\frac{1}{4}$ dwt. of gold to the ton, flows into a storage tank or "sump," whence it may be pumped back to the leaching tanks, when a fresh charge has to be treated. But the simple replacement of gold by zinc is not the only reaction which occurs in the zinc-box; we find that a notable falling off in the strength of the cyanide occurs, due to secondary reactions caused by the gold-zinc couple.

Various slight modifications have been introduced in the construction of the zinc boxes. They are usually divided into several compartments so arranged that the liquid flows alternately upward and downward through the shavings. The shavings are placed in a tray, the bottom of which is an iron wire screen of about four holes to the inch. This is supported a few inches from the bottom of the zinc box. The fine "gold slimes" fall through this screen, and may thus be separated from the undecomposed zinc when the "clean up" takes place.

The zinc boxes in use at the Robinson Works are about 20 ft. long, 2 ft. wide and 2 ft. deep, with inclined bottoms. They are divided into compartments of about 20 in. in length. Each compartment holds about a bushel of shavings, weighing perhaps 40 lbs. Seven compartments in each zinc box are filled with shavings, a single compartment at the head is left empty to receive any sand that may be carried through the filters by the solution from the tanks. A double compartment at the foot is also left empty to allow any gold that may be carried away by the stream of liquid to deposit before the solution flows into the sump. About 60 tons of solution, which is the quantity required for treating the ordinary daily charge of 225 tons of tailings are allowed to run off through two zinc boxes in about nine hours. This solution may carry from one to three ounces of gold per ton of liquid; after passing through the zinc boxes it rarely contains more than $\frac{1}{2}$ dwt., and should not contain more than $\frac{1}{4}$ dwt. if the precipitation has been properly carried out.

There are two sets of zinc boxes, one to receive the "strong solutions" ($\frac{1}{6}$ to $\frac{1}{8}$ cyanide) and one for the "weak solutions" ($\frac{1}{2}$ to $\frac{1}{4}$). The slimes formed in the weak boxes are as a rule much poorer than those in the strong boxes, and less consumption of zinc takes place in them.

is dispensed with altogether. The solution passes through a shallow trough containing mercury, in which is an inner cylindrical vessel filled with solution of carbonate of soda; the edges of the cylinder just dip beneath the mercury so that its contents are entirely cut off from the outer portion of the vessel. A rod of lead dips into the soda solution; the lead and mercury are connected with opposite poles of the battery, and the solution is electrolyzed by the passage of a current. The sodium combines with the mercury to form sodium amalgam, which at once decomposes the gold cyanide solution with formation of ordinary gold amalgam, sodium cyanide being simultaneously produced. It is claimed that much less decomposition of the cyanide takes place than with zinc, and moreover, that the outflowing solution is better adapted for dissolving fresh quantities of gold. It is obvious that in the ordinary method a large accumulation of zinc in the solutions must take place, which, in time, would render them valueless for gold extraction, whereas sodium cyanide is just as effective as the potassium compound. It must be added that the validity of the Molloy patent is at present under dispute; still if this method of precipitating should prove successful on a large scale a great improvement will have been effected.

Production of Bullion.—The third stage of the cyanide process consists in converting the precipitated gold into a marketable commodity.

The slimes are now transferred to enameled iron pans, and carefully dried over a small furnace. This is a tedious operation and requires considerable time. The richness of the dried slimes will depend on the percentage of gold present in the cyanide liquors passed through the zinc boxes. The pans in use at the Robinson Works contain about 5 or 6 gallons of dried precipitate. This may contain as much as 150, or as little as 20 oz. of gold.

The precipitate, when nearly dry, is mixed with sand, borax and bicarbonate of soda, and melted in a No. 60 crucible at a fairly high temperature. The material melts very easily, forming a very liquid slag, which, however, rapidly corrodes the pots, so that a good 60 crucible rarely lasts for more than eight meltings. The charge is not added all at once, but as

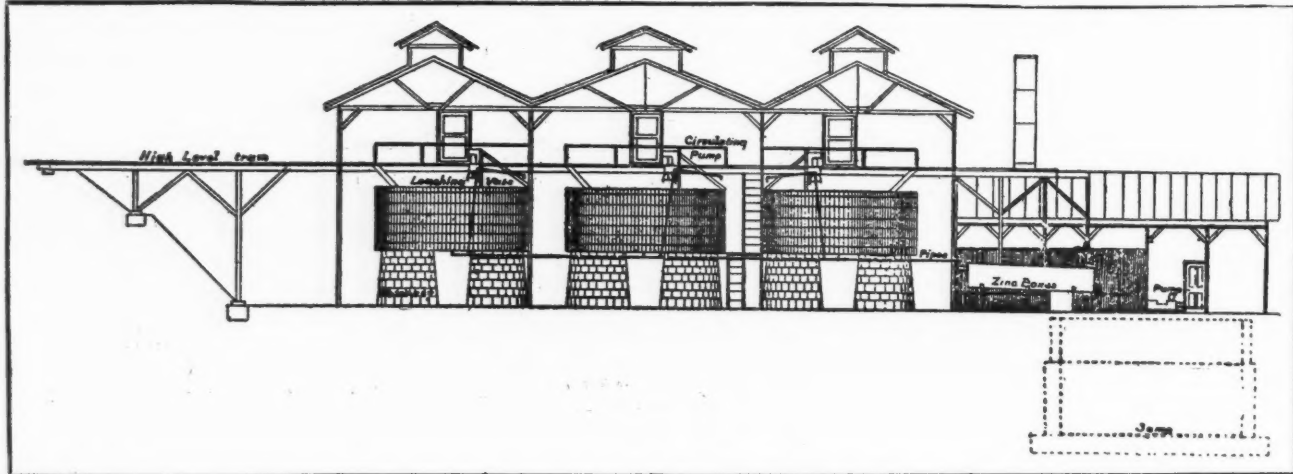
each portion melts and sinks down fresh quantities of the mixture are added. When the pot is full of liquid slag it may contain from 100 to 150 oz. of bullion. Large quantities of oxide of zinc are given off during the melting, which carry off a very appreciable amount of gold. The zinc fumes, together with the products formed by the decomposition of the cyanide salts, render the operation anything but healthy.

The bullion produced is whitish in appearance, and about 650 fine. It is very hard and brittle, and the bars are by no means uniform, so that it is difficult to obtain an accurate assay. In addition to zinc, they contain silver, lead, and sometimes a little copper. Several ways have been suggested for obtaining a purer bullion. One method consists in partial roasting of the slimes in a muffle furnace, whereby a portion of the zinc is oxidized and volatilized, leaving a much smaller mass for the subsequent smelting. By this treatment bullion of 800 fine may be obtained. Another method is to first carefully wash out the soluble cyanide salts, and then to treat with dilute sulphuric acid, which dissolves the zinc. The objection to this process is that the slimy mass is very difficult to filter, and retains the soluble zinc salts even after prolonged washing. The same trouble is encountered when the zinc is dissolved in hydrochloric acid.

Some difficulty is also experienced in washing out the soluble cyanide salts. It is possible that the use of filter presses might to some extent solve the problem of purifying the zinc slimes. The use of acid sodium sulphate as a solvent for zinc also appears to promise good results.

But what would strike an American engineer as curious is that as a rule, on these fields, no attempt is made to refine the product, because to melt straight away into bars of bullion yields more "ounces," and in Africa it is "ounces per month," and not value in "pounds sterling" or in "dollars" that one looks to.

Scope of the Process.—In general, we find that on the large scale the extraction of gold by cyanide amounts to 70 or 80%; tailings assaying 8 to 10 dwts. will give residues assaying 2 to 2½ dwts. A much higher extraction is obtainable on a small scale, with the same strength of solution, when relatively large quantities of solution are allowed to pass through



CYANIDE PLANT—ELEVATION.

the material under treatment. In its present phase the limitations of the cyanide process appear to be:

- (1.) That it is only completely successful with free-milling ores. Pyritic ores may be treated, but at a greatly increased cost.
- (2.) That it is not applicable to ores containing a considerable percentage of coarse gold.
- (3.) That it cannot be economically applied to rich material. If we can afford to lose 2 dwts. in 8 dwt.-ore, we cannot afford to lose 2 oz. in 8-oz. ore.

On the other hand, the cyanide process is admirably adapted for recovering the so-called "float gold," i.e., gold in an extremely fine state of division which remains suspended in the water for several hours and cannot be obtained by any process of amalgamation or concentration. That the cyanide process is well adapted for the treatment of Rand ores is shown by the fact that although the system has been in use little more than two years, over 40,000 tons of tailings are now being treated per month. The process is only in its infancy; the varied and complex problems to which it has given rise are mostly unsolved; its limits are yet undefined and he would be rash indeed who should dare to forecast its future.

Iron Smelting in Central Africa.—Our contemporary, *Iron*, gives an account of the methods of smelting iron adopted by the Balubans, the natives of the Muansanyomma district in Central Africa. These Balubans enjoy an excellent local reputation as ironworkers. Their ore consists of bog iron ore which is found on the surface of the land. Their smelting furnaces are constructed of clay and are 6-10 ft. high, 40-60 in. in diameter at the base and conical in shape. The ore is tipped into the furnace from the top and the charcoal is introduced through basin-like openings through the side. The air blast is also forced in through these side openings. The iron and slag are removed from the bottom of the furnace every 8-12 hours. The forge is a circular building with open sides and pointed roof. The smith's fire is in the center of the hut. The hammer is of solid iron and the tongs consist of a bent palm branch. An iron wedge driven into a timber bole serves as an anvil. The bellows are of remarkable construction. They consist of blocks of wood 20 in. long hollowed out and fitted with clay funnel head. At the other end are two orifices covered with skin. Motion is imparted by aid of two small rods. Many of these artificers are quite skillful and produce some elegant axes inlaid with copper. It is not long since these nations used stone forging tools.

TESTS OF COPPER PIPES.

The U. S. Navy Department has recently made at the New York Navy Yard an extension series of tests upon the strength of copper pipes, the special end in view being to determine the bursting pressure of banded pipes and the effect of different thicknesses and temperatures of brazing upon the strength of the seam.

It was found that to attain the best results the metal should be homogeneous throughout the length of the pipe. This can be obtained either by annealing or planishing, and of the two the latter is preferable. The best practice is to planish to within a few inches of the end before the flange is put on and finished afterward. The loss in ductility is more than compensated by the gain in strength of the joint.

It was found that the difference in strength between the annealed and planished pipes without joints was 4 to 5%; with joints from 9.5 to 11%. The planishing should be commenced at the back of the lap and carried forward to the edge in order to prevent curling.

A comparison of the results obtained shows nothing in favor of the banded pipe, and, on the contrary, it would appear that, under the conditions of test, the bands may have exerted a detrimental influence on the final strength of the pipe. Placed as the outside bands were, just at the edge of the soft metal at the ends, they probably accentuated the irregular strains which occur at this point and caused the pipe to give way at a lower pressure than they would had they not been used. In any case, it is shown that the bands when spaced, as they were, offer very little support to the intermediate metal if it is soft.

In regard to the cone joint it was found that, owing to the greater resistance to compression of the metal in the brazed joint, the outside rings would not pull up squarely and the joint would leak persistently at this point.

The flange joint tried on one of the sections after the cone joint had been abandoned was tight up to 600 pounds per square inch when the springing of the joint by pressure on the heads was sufficient to allow

it to leak. The sweated flange appeared to be equally efficient with the brazed flanges, and as the solder melts at 590°, while the melting point of brazing metal is about twice as high, the pipe is exposed to less danger of overheating in putting them on.

The flanges in soft bronze were in every case dished by the endwise pressure from one-eighth to one-fourth inch. Their strength seems to be well adjusted to that of the pipe. Many kinds of material were used for gaskets in the joints, including tough paper with red lead, wire gauze with red-lead putty, wire gauze with usdurian sheet lead, and others. One of the most satisfactory was made of annealed copper tubing of small diameter with a core of soft cord, but it was found that the joint made of one-fourth inch asbestos board stood the condition of test best.

Aluminum-Titanium Alloys.—Several manufacturers in Europe are now using aluminum in the construction of bicycles, says *Iron*. The aluminum is alloyed with a small percentage of titanium, which is said to increase the strength of aluminum very considerably. The following are given as the results of tests of the alloy and metal used for this purpose: Tensile strength of aluminum 22,300 lbs. per sq. in.; titanium alloy 73,500 lbs. The tensile strength of the alloy is very great if these figures are correct. It is greater than that of wrought iron and steel (48,000 to 67,000 lbs.) but is not so great as steel wire, which has a tensile strength of nearly 200,000 lbs. per sq. in.

Gold Mining in Dutch Guiana.—Gold mining in Dutch Guiana has made steady progress during the last year, says Mr. Wyndham, the British Consul at Paramaribo, in his last report. The output for 1891 was 1,231,919 kilos., worth about \$746,620, against 814,351 kilos, or \$498,540 in 1890. A company has been formed in New York which will introduce improved methods of working, so that the output will be still more increased. An association of miners has been formed with the object of promoting and giving publicity to the mining interest of the colony. No change has been made in the laws regarding the contracting of laborers. Although the revenue derived from the gold industry by the Government is large, nevertheless little or nothing has been expended to ameliorate the condition of miners or to promote interests of the owners. The gold industry, the Consul says, if properly fostered by the Government, would greatly enhance the value of the colony to Holland, and, if properly encouraged, foreign capital would quickly develop the mines already known and reefs that undoubtedly exist, but are as yet unexplored.

THE STEIN VANNER.

Written for the Engineering and Mining Journal by John W. Meier, M. E.

The Stein vanner is claimed to be an improvement on the Frue or Triumph vanner in treatment of mixed ores, as it finishes clean headings at one operation. The inventor, Stein, is an official at Freiberg, but his model had not attracted attention until O. Bilharz took it up and, after successful experiments, adopted it for the new Central Wäsche at the Himmelfahrt Works, where the writer saw it. Figs. 1, 2 and 3 will show its construction. It is a vanner with end bumper and side discharge. It has a frame *a*, with two rolls *e*, attached to it, revolving in boxes in same frame. They are placed at either end of the table, while three small carrying rolls are suspended beneath the frame. A gum cloth passes over the rollers *n*, over the floor *m*, and is carried by rollers *d*. The direction of its motion is shown by the arrows. The frame *a*, is hung by four rods *i*, which are attached to two levers *l*. These levers turn on a shaft *h*, which is supported by two posts *pp*. The floor and rolls, and with them the gum cloth, may be set at any pitch by turning a hand-screw *V*.

The vanner receives its percussion (150 strokes per minute) by the cam *r*, the cogs on which strike the upper part of the lever *M*. This again has a rod coupled to it which pulls the frame, giving it a motion of $\frac{5}{10}$ in. The buffer springs are shown at *n*. The roller *e* has attached to its shaft a small ratchet wheel *b*, which has a pawl, so arranged that at the forward stroke of the frame a slight forward motion is given to the ratchet wheel and consequently to the cloth. The pulp which has been previously sized, as will be described further on, passes over an apron *K*, to the gum

vanner washes an amount of pulp equivalent to 2 kilo. dry pulp per minute, or $2\frac{8}{10}$ tons in 10 hours.

It does more work than the Salzburg tables, is operated continuously, and yields at once a clean product.

The Frue vanner has done inferior work on galena and blende mixed, and its tailings are too rich. The Stein is much superior to it.

The tailings of the Stein, while poorer than those of the Rittinger or Frue vanners, occasionally require another treatment.

The Linkenbach buddle is the only large continuously working apparatus that with its great surface furnishes such clean tailings that in most cases they may be run to waste; only in treating very rich silver ores does a second treatment of tailings become necessary.

A combination of several Stein vanners, whereby middlings of the first ore and occasionally the tails are treated on other vanners, is much to be recommended. The middlings of the Linkenbach buddles and also of the rotary tables may also be worked on vanners.

At the Himmelfahrt concentrator Mr. Bilharz carefully sizes the sands and slimes by means of classifiers (Spitzlutter) and a long row of these furnishes three grades, i. e., 1, *roescher sand* (coarse sand); 2, *mittlerend sand* (medium sand), and 3, *feinen sand und schlamme* (fine sand and slimes). These different grades receive a partial concentration as follows: The coarse sand on a series of five small jigs (*stampilbe*) working on principle of the hand jig. The hutchwork from the first jigs is rich. The other hutchwork goes to the stamps. The medium sand passes from the classifier to a circular jig, invented by Mr. Bilharz, which has a plunger in the center, while a number of compartments are arranged around it; their sides run radially to the center. The hutchwork from

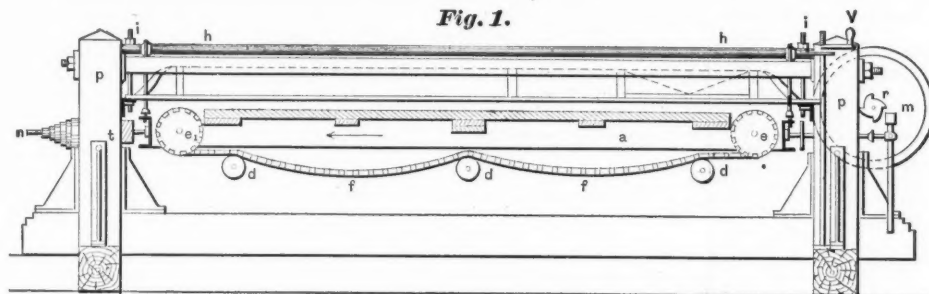


Fig. 1.

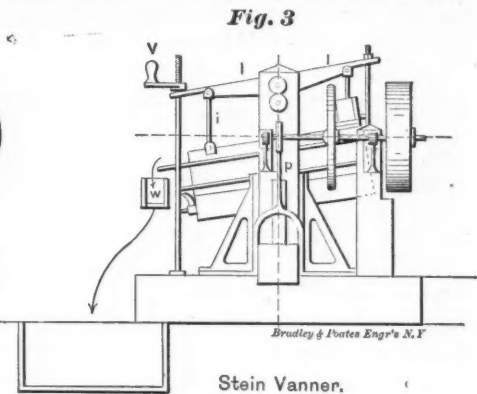


Fig. 3.

Stein Vanner.

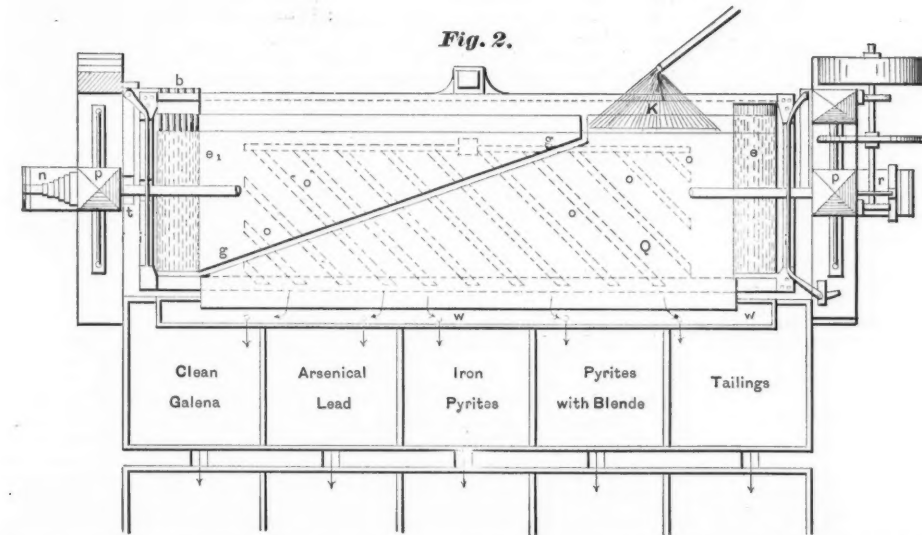


Fig. 2.

cloth, while sprinkler *gg* furnishes water, cleaning the ore. A launder *W*, with partitions, distributes the several products of table to boxes set below it. The forward motion of the gum cloth is an interrupted one, and the vibrations it receives keep the deposit of ore on its surface, while the numerous jets of water issuing from a $2\frac{1}{4}$ in. pipe *g*, serve to clean the surface and wash down the products toward the lower edge of the cloth. The floor *Q*, has a number of grooves cut diagonally into its upper surface, which are kept full of running water and thus the cloth passes over it with but little friction. This floor is 3 in. wide, and the distance between the centers of the rolls *e* and *e*₁, is $97\frac{1}{2}$ in. To the bottom of the gum cloth are fastened a number of wooden cleats, which fit into the grooves of the floor *Q*. Thus, any slipping of the cloth is rendered impossible.

At Freiberg, where pyrites and blende occur in considerable quantities, the vanner furnishes the following products: Tailings, iron pyrites and blende mixed, pure iron pyrites, arsenical pyrites and galena mixed, and pure galena. Where the pulp is not too low grade, galena with 70% Pb can be readily obtained. To better regulate the line of division between the different products, movable sheet iron pans (the sheet turned up on three sides and open on fourth) are set up on top of the launder *W*. Still, occasionally, the surface of the pulp deposit may change and blende may run over into galena if not carefully watched. The intermediate products (or middlings) require a second treatment and extra vanners may be best used for that purpose; even then it will be found impossible to separate blende and pyrites.

Mr. Blomecke, who described the vanner in *Berg und Hüttenmannische Zeitung*, claims the following points of excellence for it over other apparatus: Over the Rittinger, it has a wider surface, hence the pulp can be better cleaned by the water. The diagonal position of the sprinkler pipe is also a great advantage. The product is larger, In Freiberg one

the different compartments goes to the Stein vanners. This hutchwork forms 12 per cent. of the pulp treated and while the original pulp carried 0.0208 p. c. Ag, 5.32 Pb and 10.9 Zn the hutchwork is brought up to 0.045 p. c. Ag, 15.0 Pb and 14.0 Zn, while the tailings have but 0.005 p. c. to 0.010 Ag, no lead and 6 p. c. Zn.

The fine sands and slimes have no previous concentration, but go direct to Linkenbach buddles or to Stein vanners:—

For medium sands six vanners suffice to clear 11 tons (dry weight) of hutchwork in 10 hours, two reserve vanners handle the middlings from these. Tailings have but 0.005 to 0.010 Ag, no lead, 10-18 p. c. S and 9-10 p. c. Zn. These results show very heavy losses in zinc; they are quite as large as those experienced in Wisconsin on blende and galena ores having a very large amount of pyrites intimately mixed with them. The sands and slimes of these were worked but once on Rittinger and rotary tables.

With regard to losses of actual silver (neither the weight of ore nor of tailings being given) we may roughly estimate as follows: Supposing weight of concentrates to be equal to 5 p. c. of the hutchwork, then

100 lbs. hutchwork at 0.045 p. c. = 0.045 lbs. Ag.

And say 95 " tailings " 0.010 p. c. = 0.0095 " "

tailings therefore would represent a loss of only 21 p. c., even if it were possible to have only 5 p. c. of hutchwork in shape of concentrates; compared with the losses at Pribram it is very low indeed.

Whether these low losses can be obtained on ores carrying much grey copper, as do the ores at Pribram, will probably still have to be proved. The Stein vanners require but little labor, one mill man being able to handle eight of them, and as they appear to excel Salzburges tables and buddles in the saving of silver, a great progress may be recorded. We must still look for a machine, however, that will save the blende and slimes

THE READING MEETING OF THE INSTITUTE OF MINING ENGINEERS.

Notwithstanding the counter attractions of the Columbus festival in New York, more than one hundred members of the Institute met at the Neversink Mountain Hotel, Reading, on Tuesday evening, October 11th, and were joined the next day by a further large detachment. The attendance included fewer ladies than usual, which was somewhat surprising, as the place of meeting, which is one of universal beauty, would be expected to be extremely attractive to them. The attendance was about 200.

The meeting was an extremely enjoyable one, and some excellent papers were read, of which mention will be made in proper place. The meeting was opened by a welcome to Reading by the vice-president of the Board of Trade, and a key to the gates and hearts of Reading was presented to the president of the Institute.

President Birkinbine in his address devoted his remarks chiefly to the industrial and more particularly to the mineral statistics of the district lying within a radius of 30 to 35 miles of Reading. He said that in 1716 the smoke from the first successful iron works in Pennsylvania went up within 15 miles from Reading, and one of the earliest blast furnaces (the Colebrookdale) was also blown in near Pottstown, within the same area. As a consolation to iron masters disposed to think "the times out of joint" with the present price of pig iron, the president recalled the fact that the Colebrookdale furnace sold charcoal pig iron in 1851 "in large quantities" at about \$15 a ton in gold.

The Warwick furnace, near Pottstown, built in 1738, remained active 130 years. It was considered one of the largest in the country, being 32 ft. high, with a bosh of 7 ft. 6 in. to 9 in., and was blown with wooden bellows and produced from 25 to 30 tons of pig a week. The modern Warwick furnace, 70 ft. x 16 bosh, averages 750 tons a week and has made 875.

At Pottstown is the first plant in this country specially erected for producing basic slag for fertilizing purposes. These works have grown from a plant employing 200 men to one now requiring 2,000 men to operate its iron and steel works, which turn out nearly 1,000 tons of product daily.

One of the first rolling mills in this country, a slitting mill and nail works, was put in operation here before the Revolutionary War, at what is now Birdsboro, on the same ground now occupied by a large furnace plant, and rolling mill and nail factory.

The Robesonia furnace plant has taken the place of the old Reading furnace, built just a century ago, and it still continues to prosper on its perpetual grant of "sufficient ore for one furnace" taken from the Cornwall ore hills without royalty.

The Elizabeth furnace, built in 1750, was one of the first in this country to make iron stoves: it is said to have had the following inscription on it: "Johan Huber, der Erste Deutscher Mann Der das Eisenwerk vollfuhren kann."

which, if true, is an important item in the history of furnaces in this country. The great Cornwall iron banks, from which 12,000,000 tons of ore have already been taken, are within the 35-mile radius from Reading, and the Cornwall furnace is the oldest in the country still standing, and shows the progress made in the iron master's art from the old leathern bellows, cold blast and stone hearth to the present plant.

Near Pottsville is the first furnace to use the hot blast and the first which successfully used anthracite coal as furnace fuel, and thereby won pre-eminence for being the first anthracite furnace to run continuously on that fuel for three months.

Mr. Birkinbine referred to the development of the anthracite coal trade and erroneously credited the Mauch Chunk shipment of 365 tons in 1820 as the commencement of the trade, while it is well known that "arks" carried coal from the Wyoming Valley down the Susquehanna much before that date. President Birkinbine then gave an interesting retrospective glance over the whole Schuylkill Valley, picturing its past and present appearance and showing the appropriateness of a meeting of the Institute at a point the center of such an enormous industry.

The first paper of the meeting was on the Brown Segmental gun, concerning which the following interesting information was given:

THE BROWN SEGMENTAL WIRE GUN.

By N. B. Whitman.

The Brown segmental wire gun is built on quite a different principle from any of its predecessors. The inner core or tube is split longitudinally into segments, and these segments are pressed together by means of a continuous coil of square sectioned steel wire. One of these guns, which is being built at the Pennsylvania Diamond Drill and Manufacturing Company's Works at Birdsboro, is a 5-in. breech-loader, 19 ft. long. The cross-section of the wire is .005 sq. in. The wire is wound on at a tension of 130,000 lbs. per square inch, so that the resulting pressure between the segments is 100,000 lbs. per square inch. This pressure represents the elastic limit of the steel of the segments. It will not be overcome until the internal explosive pressure exceeds 63,200 lbs. per square inch. This construction of the gun tube in segments held together tightly results in a higher physical condition and a higher degree of internal elasticity than has ever been obtained in the tube of a modern high power cannon.

The segments are 18 ft. 4 in. long and taper from 3 in. in thickness at the breech to 0.8 in. at the muzzle. The steel wire covering is 33 layers or 2.31 in. thick at the breech and for the rest of the way one layer is dropped every ten inches so that there are only 10 layers at the muzzle. The tensile strength of the steel of the segments is 165,000 lbs. per square inch and the elastic limit 100,000 lbs. per square inch. The same figures for steel wire are 250,000 lbs. per square inch and 200,000 lbs. per square inch.

The wire is wound on by a special machine designed by Mr. Brown to give a constant tension of 650 lbs. per strand. A special method has been invented also by Mr. Brown for anchoring the wire at each end.

The trunnions are attached to a trunnion jacket which is screwed to the breech of the gun, and the greater portion of the longitudinal thrust produced by firing is taken up by this jacket and not by the inner tube. This is a new feature. The chase of the gun is protected from the fire of small arms and machine guns by a steel jacket shrunk upon it. The breech block is of novel design. A continuous thread is used, and when

the block is thrown open for charging, a latch locks it, so that it cannot be turned until it enters the breech. This insures proper centering of the threads under all circumstances and a consequent minimum of wear.

The ordinary charge of this gun will generate 50,000 pounds per square inch pressure, and 60,000 pounds can be reached with perfect safety. The service charge of a gun of this size made in the usual way is limited to a pressure of 37,000 pounds per square inch.

NOTE ON THE OCCURRENCE OF GRAHAMITE IN TEXAS.

By E. T. Dumble.

A few years ago Mr. Melcher, of the State Survey, discovered some of the variety of asphaltum, known as grahamite, in the brown coal beds in Buckner and O'Quinn's creeks, Fayette County, Texas. It occurs here in very small quantities, in fact it is present only as small particles, distributed around and in a 6-in. coal seam. Since then, in 1889, Dr. Pense and the writer found a thin broken seam of grahamite on a bluff on Rio Grande, Webb County, just at the contact of the Cretaceous clays with the overlying Tertiary sands and green sands. It is here mixed with gypsum and sulphur, and exists only in small pieces. At both these localities the grahamite has a larger percentage of sulphur than is usually the case.

THE GRADING OF PIG IRON.

By E. T. Clymer.

The object of the author in writing this paper was to again draw attention to the fact that the old established method of judging a pig iron by its fracture is not an infallible one. The writer's experience leads him to believe that the grain of iron indicates with considerable accuracy the condition of carbon in the pig, to what extent it is combined and to what extent graphitic, but further than that, the method is useless and misleading. For instance, an iron containing enough phosphorus, sulphur or manganese to render it unfit for the foundry, may nevertheless have an open grain. It may have so little silicon that on remelting it will run hard and yet the grain of the pig may not show it. Again, a close-grained iron will often be soft and fluid. The writer is not prepared to propose any general method of grading irons, but hopes to stir up a discussion in which various makers' views will be brought out.

THE WIBORGH AIR PYROMETER.

By Emanuel Trotz.

Wiborgh's pyrometer is now in such a form that it can be placed on the market as a useful and trustworthy instrument, capable of measuring temperatures varying from 0° to 2,400° F. The instrument consists of an air chamber in the shape of a porcelain globe, which is placed in blast furnace or other seat of heat to be measured. This globe is connected by a capillary tube to the atmosphere, to a collapsible metallic chamber of definite volume when expanded, and to a manometer. The porcelain globe is first put in place while the interior is open to the atmosphere. After the air inside has been heated up to the temperature to be measured, the opening to the atmosphere is closed and the contents of collapsible chamber, which also has hitherto been open to the atmosphere, are forced into the porcelain globe. The increase of pressure thus obtained inside the globe is measured by the manometer, and from that the original temperature of the contents of the globe can be ascertained. This measurement is effected automatically by a specially prepared scale and other intermediate arrangements. With the help of illustrations, we shall be able, in a future issue, to explain the mechanism of the instrument.

THE ROCK DRILL APPLIED TO OPENING THE TAPPING HOLE OF A BLAST FURNACE.

By David Baker.

Labor-saving devices in connection with blast furnaces have received comparatively little attention. It is true that machines are used for hoisting and blowing, but charging, tapping, casting and handling the pig iron in the beds are still performed chiefly by manual labor. The opening of a tap hole at present requires the labor of eight to ten men, and the time occupied varies from 10 to 60 minutes. This work is so difficult that it is usual to call on the services of the men in the stock house. Probably the reason for there not having been any attempts to diminish the manual labor at the tapping hole has been that there have always been plenty of fillers available as helps at the tapping operation. At the blast furnaces of the Maryland Steel Company a new system of mechanical furnace charging has recently been adopted, and this has made it possible to dispense with a large proportion of the fillers. Thus it became necessary to devise some method of substituting a machine for labor in the tapping process. After several experiments with a large Rand drill an arrangement was found which answered the purpose excellently, and now the drilling of the hole is accomplished entirely by mechanical means. The Rand drill is supported in a frame in which it can slide longitudinally. The frame is suspended at the outer end by means of chains, and its inner end is jointed to a horizontal bar. This bar has guides at each end, which can slide up and down in vertical channels fixed to pillars. The frame is suitably counterpoised so that it can be moved up and down easily. The steam is supplied through a three-way cock to the working cylinder or to the feed, and the arrangement is such that the drill may be withdrawn rapidly in the face of the stream of molten iron. Thus the drill may be moved about in all directions with great ease and no injury nor delay is likely to ensue.

THE TALC INDUSTRY AT GOUVERNEUR, N. Y.

By Axel Sahlin, M. E.

Some fifteen years ago quantities of fibrous talc of great purity and whiteness were discovered in the neighborhood of the town of Gouverneur, St. Lawrence County, N. Y., and it was not long before the paper makers of New England and Pennsylvania found out that it would make an excellent substitute for sulphate of lime and clay, the usual adulterants used in the manufacture of paper. After a time the fibrous character of the talc was proved to have an exceedingly beneficial effect in binding together the wood pulp, with the result that a very hard and compact paper was made. Thus the use of talc was no longer kept secret, but, on the other hand, its advantages were publicly made known. Abou-

30 per cent. or more of good printing paper as now used consists of talc or other mining matter. This Gouverneur talc is said to be the finest in the world. It combines the brilliant whiteness of North and South Carolina talc with the fibrous quality of the Virginia article.

The town of Gouverneur is situated near the northwest edge of a geological island of granite, gneiss and marble rocks. Toward the west of the town, Potsdam sandstone is encountered, and the Trenton limestones are found on the southeast side. The talc bed is found in the towns of Fowler and Edwards, from 7 to 14 miles southeast of Gouverneur. It has a length of about eight miles and a width of one mile. It crosses the Azolic rocks in a general direction of W. N. W. to E. S. E. The veins dip from 45° to 75° toward the northeast, and their width varies from a few inches to 20 feet and more. Local specialists say that it is no use looking for talc except where there are surface outcroppings, and the abrupt change of formation precludes the probability of any new deposits being discovered in the district. The veins of talc minerals are separated by layers of granite and gneiss.

The minerals are chiefly in the form of agalite and rensselaerite, *i. e.*, hydrated silicate of magnesia, and among the agalite there are found nodules of such anhydrous silicates as hornblende and hexagonite. This would lead us to believe that the deposit originally consisted of hornblende and that this has been gradually hydrated.

Since 1879 ten distinct mines have been opened and some have reached to a depth of over 400 ft. on the slope. The total annual output is about 51,000 tons. The cost of mining varies from 60 cents to \$1.25 per ton, and the royalty to land owners amounts to from 50 cents to \$1 per ton. The cost of transport over wretched roads to the mills costs from \$1.35 to \$1.50 per ton. The total cost at mill therefore varies from \$2.35 to \$3.75 per ton.

The talc is passed successively through a coarse and a fine crusher and then through two pairs of burr stones. It is then loaded into cars and about 800 to 1,000 lbs. charged at a time into an Aising cylinder 6 ft. 11 in. diameter and from 6 ft. to 10 ft. long. This cylinder is lined with porcelain brick and filled to one-third its volume with Greenland pebbles. The cylinder is revolved 3½-4 hours at the rate of 20 revolutions per minute, and at the end of that time the talc is found to be in the form of an impalpable powder. The heat generated by the friction of the pebbles is of course very great and sufficient to crack the pebbles after some time, but the talc is uninjured owing to its refractory character. Hitherto much of the rensselaerite has been thrown away, as it took too long a process to remove the gumminess of the minute scales. However, Cycloane pulverizers have lately been introduced by two of the Gouverneur firms and they are found to do the work of the small crushers, burr stones and Aising cylinders with equal results and economy in power.

On Wednesday, the forenoon was occupied in reading of papers—the most notable of these, and one of the most valuable papers yet read in the institute, was by Mr. Joseph Hartsorn on the Basic-Bessemer plant, of the Pittstown Iron Company. This paper will be published in an early issue of the JOURNAL.

Mr. Frank A. Hill read a valuable history of how the mine fire in the Hill Farm Parrish mine and this also will shortly appear in abstract.

Mr. J. H. Carpenter, of the Carpenter Steel Company of Reading, gave an interesting lecture on steel and improvements in its manufacture, and subsequently showed in his own works some admirable specimens of steel and the casting and finishing of steel projectiles, which he assured us the government had never been able to break. Some one remarked that if the government kept on buying them they might break the government referring to the statement that they were worth 50 cents per pound.

Mr. Carpenter certainly makes excellent steel, and believes he has advanced further on the path of progress than ever before.

The visit to the pipe mill and hardware works was too hurried to give those who joined in it much information.

The concert and hop on Wednesday evening do not call for special mention beyond the opportunity they gave of becoming acquainted with the Reading notables, who had already contributed in so many ways to the pleasure of the members of the Institute. The remainder of the meeting will be reported in our next issue.

MECHANICAL NOTES.

Written for the Engineering and Mining Journal by Albert D. Pents.

It is about as easy to get good men as it is to retain them. The trouble is frequently in a man himself. He may be a restless, dissatisfied person who is looking for some place or opportunity that never is found. It is of no use to induce this kind of man to stay, so he will eventually. Another may be a good man, but yet not so good as he thinks, therefore, he may want more than his ratio of pay, and if he does not get it he sulks. The trouble with another man may be that his shopmates may conspire to oust him through envy or organization. This is not always an easy thing to get at, and each case must be treated by itself on its own merits. No ready made remedy will cover it and fit. A man may be a good workman and not hitch with his foreman or manager, in which case one or the other should go, if they cannot be reconciled, for without harmony of action no economy is possible. The principal difficulty in keeping good men, however, is that they are not paid enough. The cause of this is generally in the mistaken economy of some one man, or the operation of an arbitrary rule. A manager frequently thinks that he is getting wonderfully cheap help when he is getting only marvelously poor work. Another person working for a reputation as an economical foreman will by promises for the future and pretexts for not fulfilling them have about him new underpaid men coming, and those nearly as new going all the time. Some concerns have a rule to pay no more than \$3 per day to any man. As a consequence the place will be filled by men who would be dear in any other shop at \$2.50. The ideal shop where men would be satisfied and the concern succeed would be where about 20% of the skilled workmen could earn \$5 a day. Earn it!

The question as to who is entitled to the benefits derived from labor saving improvements has got to be publicly discussed, whether it is

an agreeable question or whether it is not. It is the popular idea that the inventor does not get the benefits of his creations. Is he in fact entitled to them? The manufacturers and their lawyers get the benefits of all the patented inventions that are worked, but are they entitled to them? A labor saving device always cheapens a product, and when the patent has expired competition always skims the cream off the profits. Who by right owns this saving? If the manufacturers do not get it, do the consumers get all of it? Or is there an ever increasing army of non-productive handiers who neither add to the value of an article nor transport it nearer the consumer, but who pass it about among themselves and each of them charge a profit for each time they handle it? Do the members of this army live at the expense of the producer, and better than he; at the cost of the consumer absorbing the profits that are the result of improved machinery? In this connection I have the data of one kind of machinery that is duplicated in large numbers, and each one of these machines go out of the factory for a price of about \$8, showing as great a profit as the trade will stand. These machines could not be made without special machinery for less than \$50 each. Hence the saving due to invention is at least 80%. These machines retail at \$40 each, showing that the consumer can buy them 20% cheaper than they could be made without special machinery. It may be assumed fairly that the consumer of this machine gets 30% of the results of invention, allowing 10% for transportation and profits outside the factory. The difference between the present cost of these machines to the first buyer and the cost to the last one is exactly four-fifths, or 80%. Now, allowing a sum equal to their cost for every necessary profit and transportation until they reach consumers, there still is left 60% of the selling price for what? To whom?

There is a phase of the patent and copyright question which is a very peculiar one. Patent and copyright cover with protection the same abstract thing exactly, that is, the right of a creator to his property in his creations for a limited time in consideration of his disclosing to the public what he has created. This right, however, is treated in one fashion when it is property in the patent of a material invention, and in another fashion when it is the copyright of a graphical representation or description of an idea, which need not or necessarily be an original one, by every government that notices them so far as to legislate in these interests. In this country a man may work a lifetime on a machine which, when he perfects it, will reduce the labor in an art 90%, yet it can be protected as his property but 17 years. A photograph or a written description of that same machine can, however, be protected 42 years, and further, they may soon be protected in many other countries by the simple act of American registration. The cost of copyright in fees for 42 years is presumably \$1 and two copies of the article copyrighted, averaging perhaps \$2 per copyright. The cost of a patent, restricted to this country, is \$50 in government fees for 17 years, and attorney's fees will average about as much more. Hence a patent costs actually thirty-five times as much and covers a period of less than 11% of that available for copyright. Again, every copyright that is asked for is allowed and there is no vexatious examination made. These things indicate the value of agitation by those able to present their cases clearly as writers can in asking protection for their creations, for literature furnishes the bulk of copyright subjects. Inventors have not agitated, though some manufacturers have worked in disjointed ways to obtain longer terms for some particular patents. And attorneys have labored to have the government fees reduced, presumably to increase the catch by augmenting the number of applications. Now a valid patent is worth all it costs for government fees if it has any practical worth. A copyright for many things has not more value than 00c., while it is also true of many of the patents issued. But, if a copyright properly exists 42 years, there is good reason why a patent should also, and if international copyright be justice then is international patent righteousness.

The evolution of patent protection in this country has brought to pass the condition of affairs that makes a patent of no actual value until it is attacked and defended in a court of equity. This is expensive, but it is right, for no man within the Patent Office nor out of it knows whether a thing which appears to be novel actually is or is not. The trial settles that as far as it can be settled, for one side is interested in proving novelty and the other in proving that it was an old affair at the time it was patented and thus the facts come out. Hence a search in the Patent Office by the examiner for novelty during pendency has but little value if it has any. It often is a farce. Now, after many years of consideration I believe the procedure in issuing patents and their forms should be modified thus: The applicant as now, and more clearly than now if possible, to specify that he believes he has invented. Then to claim his invention all in one claim and every patent to have the same one claim in a form prescribed by the patent laws modified for that purpose. This form to be similar to this: I CLAIM as my invention: Substantially the methods and mechanisms hereinbefore shown in the drawings and described in this specification in so far as such are novel and useful; whether such inventions consist of the whole device as shown, or of novel groups in combination, or of novel elements or of novel functions, or of all of these, or a part of them—The examination, if it survived, should be cautionary and educational, of a nature to pilot the manufacturer toward safety. It should be made as now before the final fee, so that the applicant could abandon his case if it should appear from the examination that he would not probably be permitted to manufacture because he infringed a prior patent. Attorneys would have to be careful and intelligent, and draughtsmen would have to be accurate and omit nothing. Every inventor then could have his patent if he cared to accept it. The injustice that always has followed inventors who could not accurately describe nor clearly claim their work would be removed and he would have all that his drawings showed him to have first discovered. There would be no more litigation than now, when all patents of value are fought for. I believe that every person who studies this will agree with me that this will simplify the problem in all points, and be a benefit to every one.

A MECHANICAL DIAMOND WASHER.

The "Diamond Fields Advertiser" gives the following description of a mechanical diamond washer and process of using it, recently patented by Mr. McLelland, General Manager of the New Gordon Diamond Co.:

"The diamondiferous ground is brought direct from the mine, and is dumped on to a broad slanting picking-table or chute, where stone and other extraneous substances are caught and removed by hand, while the 'dirt' falls in regulated quantities into two powerful crushing machines, each capable of treating 20 to 30 loads per hour. These machines crush and deliver the ground in continuous streams into two chutes, which lead it to a pit, whence it is elevated by an endless chain of buckets and delivered to a cylindrical screen. Here it is sorted into two sizes before passing to the pulsators. The finer stuff which falls through the screen is caught by an apron and carried by a chute into the first pulsator, while the larger stuff falls from the mouth of the screen to the second pulsator. Through each of these pulsators a current of water is forced, by means of plungers, which receive a reciprocal motion, raising the lighter portions sufficiently high to be discharged by overflow spouts, while the gems and other matter, in consequence of their greater specific gravity, fall to the bottom and are detained. The stuff from the overflow spouts, having been deprived of its slime and muddy water, is fed by means of conveyors and elevators to separate sets of crushing rolls, which reduce it to a second stage of fineness. Passing from these rolls the stuff is carried to a third pulsator, or returned to either of the pulsators before mentioned at option, being finally discharged as mere waste tailings. There is a double launder about 200 ft. long conveniently fixed to receive the muddy water and slime discharge from the fine meshed cylindrical screens which separate it from the ground stuff during the passage of the latter from the pulsators to the rolls. This launder acts as a settling trough wherein the heavier portion of the suspended earthy matter settles and deposits itself, while the muddy water is carried by the same launder to the well of a centrifugal pump, where it is elevated to the pulsators before mentioned, and used over again. Rails are fixed over the launder and a wide scraper mounted on a carriage capable of being elevated or depressed, so that the scraper blade may be adjusted to take out the earthy deposit into trucks, the carriage being operated by a wire traveling over loose and fast pulleys."

The plant now in operation is capable of treating 600 loads per day, which is small as compared with that treated in the usual way, but the machine has several advantages, which, according to the above authority, will lead to its extended use. These are: first, "dirt" can be treated direct from the mine, and consequently 6 months' time is saved; secondly, stealing of gems is almost impossible. In conclusion it is stated that the machine is especially suitable for small companies. The custom heretofore has been to leave the blue dirt on large floors for months to disintegrate by the action of the elements. This invention, if successfully applied, will be the source of a great saving, both in time and money.

THE TRANSVAAL SILVER MINES.

The Transvaal Silver Mines are practically the only argentiferous galena mines in South Africa. The company which was started to work them in 1889 made no profit, and it was only after the reconstruction of the company, in May, 1890, and the subsequent appointment of Mr. O. H. Hahn, late of Pueblo, Colo., that the deposit was properly opened, and the prospects of successful results shown to exist. In the last report issued by the company it was announced that 50,000 tons of ore averaging 22% of lead and 26 oz. of silver were in sight, and that this would be sufficient to keep two furnaces at work for five years. The highest grade of ore after dressing contains 70% of lead, and from 90 to 100 oz. of silver per ton. It will be seen, therefore, that if the ore is as good as is claimed, and the supply permanent, there is a prospect of a good dividend being paid on the present capital, £146,700.

The Transvaal Silver Mines are situated about 45 miles to the north-east of Johannesburg, and the surface covered amounts to 1,466 acres. No railroad goes nearer than Boksburg, and the remaining transit is accomplished on very fair wagon roads. Iron ore and limestone are abundant and excellent domestic coke from Maggie's Mine on Olifant's River can be had for £4 per ton, delivered at mine.

The natural scenery at the mines does not exhibit the usual characteristics of silver-lead regions. The surface is not mountainous nor broken, and consists solely of an apparently endless tract of bleak and barren undulating ground with only a few outcroppings of quartzites and igneous rocks. The ores are found in lodes, and occur in masses of diorite and diabase rocks, which have protruded themselves through the local beds of sandstones, schists, conglomerates, etc. The galena has often a foliated structure, and for this reason it may be supposed that the veins were deposited through the medium of hot mineral springs. If this is so, it is likely that the lode will continue to great depths, although it may vary considerably in breadth. The lode contains, besides argentiferous galena, carbonate of iron, zinc blende, chalcopyrite, iron pyrites and smaller quantities of cerussite, anglesite, pyromorphite, vanadinite, wolfeinite and crocoisite. The gangue matter consists principally of carbonate of iron, quartz and calc spar, mixed with some of the greenstone rock.

The main lode varies in width from a few inches to over ten feet, but the average is about four feet. It strikes about 20° west of north, and dips to the southwest at varying angles. It has been traced on the line of its outcrop for several miles, and has been actually proved to exist for several thousand feet by sinking shafts and levels. The principal portion of the mine development has been carried out on what is known as the west lode, and though a certain amount of work has been done on the east lode, the operations at present are confined to the west lode. The main vertical shaft on the west lode is equipped with first rate raising machinery and ore screens. The ore is raised from the mine in iron trucks on cages fitted with safety catches, and is then run over lines on trestles and dumped over screens. The hoisting plant and pumping plant are arranged in a shed along with an electric light plant. There are also a machine shop, carpenter shops and a smithy attached to the works.

The newly erected smelting plant is the first of its kind in South Africa.

The ore is first sorted (after extracting the first grade containing 70% lead and 90 to 100 oz. silver, which is exported) up to an average of from 21 to 30% of lead and 30 to 35 oz. of silver to the ton and then transported by cars to the smelters. One smelter is of the latest American manufacture; the other was made by the Sandycroft Foundry, of England. Each furnace has a daily smelting capacity of 36 to 40 tons of ore and yields from 6 to 9 tons of lead bullion daily. The fumes from the furnaces are drawn off below the charging floor through a wrought iron tube, 3 ft. in diameter. This tube connects with a brick flue 8 ft. wide 8 ft. high and 50 feet long and terminates in a dust chamber 25 ft. broad by 32 ft. long by 12 ft. high, from which the chimney shaft rises. The smelting area of each furnace at the level of the tuyeres is 3 ft. 6 in. by 8 ft. 4 in. and the top section is 5 ft. by 8 ft. 4 in. The air blast is supplied by two Baker blowers. The molten lead is drawn off from the bottom of the furnaces through an automatic tap into a kettle, whence it is ladled into moulds. The charge floor is about 22 ft. above the smelting floor. No iron hood is used for covering in the furnaces. The average charge is composed of the following constituents: Coke, 200 lbs.; oxidized ores, 250 lbs.; smalls (lead), 805 lbs.; iron ore, 75 lbs.; dolomite, 120 lbs.; slag, 200 lbs.; 42 charges made up in these proportions are heated in 12 hrs., and the result is 72 bars of lead bullion weighing each 112 lbs., and 78 pots of slag. The bullion averages 126 oz. of silver to the ton. Owing to the excessive quantity of sulphur in the ores it has been found necessary to roast the ore before smelting. With this object a crushing plant has been erected, consisting of a Blake crusher and a set of Cornish rolls. The crusher breaks the fluxes for the furnace and the rolls grind ore for roasting. The roasting apparatus consists of two reverberatory furnaces, each of a capacity of ten tons daily. Until further roasting accommodation is provided, only one of the smelters can be employed.

The cost of smelting with native coke is about £1 15s. 9½d. per ton of ore, and the total cost per ton inclusive of all charges is estimated at £5 7s. 1d. The estimated net profit is £30 per ton of lead bullion.

Coal Production of France.—The Minister of Public works has just published the coal production of France for the first six months of 1892. These figures show an output of 12,864,754 tons of bituminous and anthracite coal, which is a decrease of 17,057 tons compared with the corresponding period of 1891. The output of lignite was 243,458 tons, a decrease of 15,667 tons.

Fall of a Locomotive into Mine Workings.—A serious subsidence of land occurred on the Furness Railway, near Barrow, Eng., a week or two ago. The permanent way there runs over some of the Barrow hematite mines and the ground is honeycombed in all directions and to points very near the surface. As a heavy locomotive was passing along the ground suddenly gave way and the locomotive sunk down among all manners of earth to a depth of 100 ft. There is no hope of recovering the engine and a loss of \$12,500 will thus be entailed in addition to the expense of renewing the permanent way.

Smelting Iron Sand in New Zealand.—Various attempts have been made to use the iron sands which occur so abundantly along the coast of New Zealand, but until recently no practical process could be devised. Mr. E. M. Smith, of New Plymouth, according to the *New Zealand Herald*, has solved the problem by mixing the iron sand with clay and forming it into bricks. Mr. Smith's first experiments were with bricks made 15 years ago. A blast furnace at Onehunga was charged with these bricks, sea shells being used as flux and coke as fuel. The iron produced was said by experts to be of good merchantable quality and better than any hitherto produced in the colony. A quantity of these bricks is now being made and it is proposed to try them on a more extended scale. Mr. Smith claims that the bricks can be made to yield 50% in metallic iron. The results obtained are important, and further news will be awaited with interest.

Wrought Iron vs. Steel.—An English experimenter, Mr. A. Blechyn-den, of Barrow-in-Furness, England, has recently published an account of some experiments made to determine the relative value of wrought iron and steel in the manufacture of non-leaking tubes. He used tubes of Siemens-Martin steel and Scotch BB brand of wrought iron in his experiments. The general result was that, after several successive heatings in a furnace and cooling in water, the iron tubes were found to have contracted less than the steel tubes, and that the steel tubes were much looser in their sockets than the iron tubes. From this he concludes that wrought iron is more serviceable than steel in boilers, more especially in high pressure boilers. It is probable that the results obtained were due more or less to the special conditions under which the experiments were made, and it is probable that other experiments in this line may secure conflicting results.

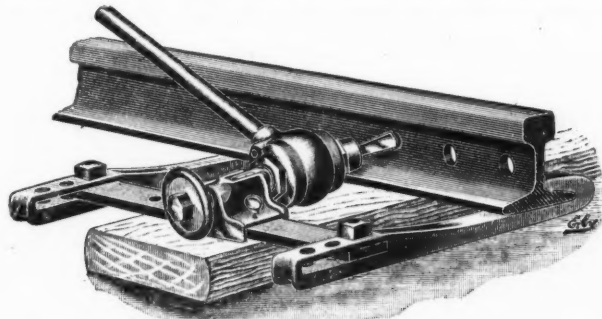
New Methods of Tin Mining in the Malay Peninsula.—The system of tin mining at Kinta, Malay Peninsula, has, according to Mr. Leech, completely changed within the last year, owing to the introduction of short wash boxes, called by the natives *lanhut kechil*. Mr. Leech, who is an official in Perak, describes these wash boxes in a recent report as follows: The wash box employed formerly was 30 ft. long, and could only be used with a considerable head of water; a 6-in. steam pump could only keep two boxes going, and, as a natural consequence, only land in the neighborhood of large streams of water, or in which the owners could afford steam or water power pumps, could be worked. Considerable capital was required to open a mine, and the only part of the land worth washing was the karang, or rich tin deposit, found at a depth of from 10 ft. to 50 ft. below the surface. The introduction of the *lanhut kechil* has changed all this. The box itself is but 8 ft. long and costs \$4. It can be put up wherever there is a pool of water, instead of requiring a steam pump; it can be supplied with water by one man lading and, instead of stripping the surface soil, the surface soil itself is now washed in the *lanhut kechil*, the same water being used over and over again; the mining coolies earning from 30 cents to \$3 a day each. Five or six men work to one box. Owing to the small quantity of water used under this system, thousands of acres of land which were formerly looked upon as unproductive are now being worked.

THE SCHUTTLER RATCHET TRACK DRILL.

This drill works continuously in one direction by the movement of the handle in both directions. It is quickly attached to either the inside or outside of the rail, without interfering with passing trains. All parts are interchangeable. The frame is adjustable both laterally and longitudinally, the entire weight of all being about 25 pounds. All the holes for a joint may be drilled without moving the clamps. All the parts are of first-class workmanship, and the material of the best quality, crucible steel being employed for the working parts, and the gears being cut and not cast. The shell is of malleable iron with the facings ground, thus perfectly protecting the working parts from water, sand and dirt. The carriage clamps are of malleable iron so distributed as to get the maximum strength, with the minimum weight of metal employed. The movable bar at the back of the carriage is of tempered steel and will not take permanent set.

Artificial India Rubber.—Some months ago Dr. Tilden discovered that isoprene, a derivative of turpentine, changes under certain conditions into a substance almost easily similar to india rubber. *Industries* states that M. Bouchardat has also recently prepared this artificial rubber from isoprene by the application of heat alone. The material so produced is said to resemble pure Para rubber, and, though it is not proved to be rubber identically, it is claimed to be as good for all practical purposes.

The Scottish Oil Trade.—The difficulty of maintaining a "combine" is aptly illustrated by the case of the Scottish Mineral Oil Association. Just at present it is in a critical state owing to the withdrawal of one of the members, the Pumpherton Company. This company is as desirous as the rest to maintain prices, but they complain that the other companies have been stealing a march on them by turning the whole of their scale into candles, which the Pumpherton either cannot or will not. The result is that the Pumpherton Company has gone out of the "combine" and are selling their scale at a cent per pound below the American article.



THE SCHUTTLER RATCHET TRACK DRILL.

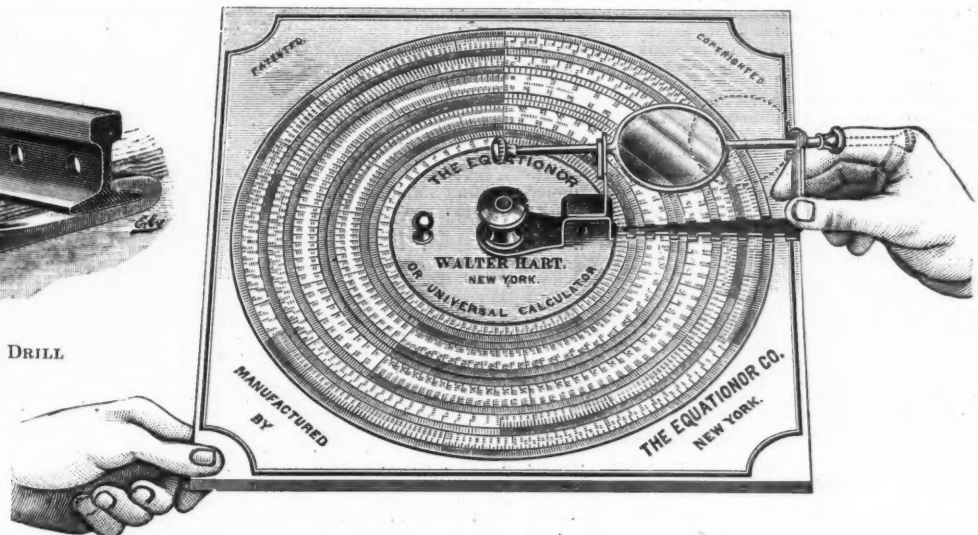
HART'S EQUATIONOR.

The machine or mechanical calculator here illustrated cannot fail to be a great *time-saver* to contractors, engineers, machinists, surveyors, accountants—in fact to all who have occasion to solve or perform numerical operations. This device belongs to the class known as slide rules, and has the great advantage of having all its figures in a single plane. It consists of a wooden base about 9 in. square and $\frac{1}{4}$ in. thick, bound with nickel-plated metal. Within a circle 8 in. in diameter are a series of circular scales on the faces of two metal plates, the inner plate revolving on a central hub. The inner circle is provided with two nickel-plated knobs by which it is revolved, while on the under side of the board is a metal point to facilitate the revolving of the outer plate on the table or desk. A lens to magnify the finer lines is pivoted at the center. The base of the frame of the lens forms a notched edge to bring the figures or lines under consideration in line. The frame is held in place by a removal thumb screw. The inner set of scales is on a white ground and called the rule; the outer set of scales is on a green ground and called the rule.

In operation the slide revolving within the rule allows of changing the relative position of marks or numbers on either side or rule in regard to the marks or number on the other. By bringing a mark or value that is on a scale of one part in line with a mark or value on a scale of the other part, problems are set and their solutions or answers effected.

It is claimed that with the device numbers with their squares, cubes and reciprocals are shown at a glance; that proportions may be obtained directly or inversely, also roots and powers, and that with the assistance of tables of natural sines, tangents, etc., it solves trigonometrical equations.

Tempering Curved Armor Plate.—An experiment was made at the Bethlehem Iron Company's armor plate department on the 28th ult. of tempering curved armor plate which had been subjected to the Harvey nickelizing process. The attempt was the first made with curved armor,



HART'S EQUATIONOR.

The Nicaragua Canal.—On March 29th the California State Nicaragua Canal Convention held a meeting at San Francisco at which it was resolved that "it is deemed wise and expedient that a National Nicaragua Canal Convention be held at St. Louis, Mo., on June 2nd." The Governor of California was requested to inform the Governors of all the other States and Territories of this resolution and to ask such Governors to appoint delegates to the Convention; two delegates being appointed for each Senator and Congressman from the States. This Convention duly met at the time appointed and held a session of two days. Addresses were made by Governor Francis of Missouri, Judge Estee of California, and by Mr. Warner Miller, President of the Nicaragua Construction Company. Mr. Miller in his address gave the history of the undertaking, also an account of the work already performed. From it we learn that the final surveys and maps have been made, headquarters have been erected at Greytown which include barracks, hospital, warehouses and machine shops; the harbor at Greytown has been opened to a depth of 14 ft. on the bar; and, the company has bought the plant of the American Dredging Company, which did much work at Panama. The right of way has been cleared of timber for 10 miles and 5,000 acres are cleared, ready for dredging. One mile of the canal proper, west from Greytown, has been opened up to a depth of 17 ft. Borings of the rock cuttings over the whole line have been made at a distance of every 1,000 ft. Finally, 11 miles of railway have been completed. In all this work the company has spent about \$5,000,000. The convention after adopting a permanent organization, with Mr. G. L. Converse of Ohio as president, adopted a series of preambles and resolutions to the effect that the construction of the canal is feasible; that a fair and conservative estimate of the cost is \$87,084,176, and that the canal can be built in five years. Congress was asked to give financial assistance to the enterprise and the people were recommended to invest in its securities. At present, according to information received from General Manager Davis, but 400 men are employed dredging in the harbor at Greytown. That this is the best and only place to cut a canal from the Atlantic to the Pacific there is no doubt, but the present time is not propitious for an enterprise of this magnitude. The disastrous failure of the Panama Canal Company has made ordinary people wary about investing in this class of enterprises, and the still more recent failures of the Barings and the Mariettas have caused capitalists to become so timid that they prefer a 2% investment which is safe, to an uncertain 6% investment.

and was entirely successful. The plate weighed 14,000 lbs. and was 10 $\frac{1}{2}$ in. thick. The curvature was the same as that of the plate used on the turret of the Miantonomah. Ice water was used in tempering, and the contraction was very slight. Borings from the plate were examined at every one-eighth of an inch depth, and the solidity was satisfactory. The plate was then dipped in a tank of oil, where it is now suspended. The contraction or shrinkage will be ascertained in a few days. The curved plate referred to is of the same thickness, and had undergone the same process as the flat plates, which have already stood such wonderfully successful tests at Indian Head and Bethlehem. In these tests, in which 8-in. high-power navy breech-loading rifles and Holtzer forged steel shells were used, the results established the fact that the United States is now turning out the best armor plate in the world. Out of five shots each, with a striking velocity of 1,700 ft., fired at the Bethlehem plate, only two of the shells penetrated a few inches, but all five of these high-class, armor-piercing projectiles were destroyed. The plate was not cracked by the test. The success, therefore, of the above-mentioned experiment in tempering curved Harveyized plates is of the utmost importance, and marks another great stride in the progress of naval construction in this country.

PATENTS GRANTED BY THE UNITED STATES PATENT OFFICE.

The following is a list of the patents relating to mining, metallurgy and kindred subjects issued by the United States Patent Office:

- TUESDAY, OCTOBER 11TH, 1892.
- 484,016. Fume Arrester. Malvern W. Iles and Dennis Sedy, Denver, Colo.
 - 484,017. Device for Catching and Saving Fumes from Metallurgical Furnaces. Malvern W. Iles, Denver, Colo.
 - 484,018. Blast Furnace Top. Malvern W. Iles, Denver, Colo.
 - 484,019. Dumping Car. Malvern W. Iles, Denver, Colo.
 - 484,020. Blast Furnace. Malvern W. Iles, Denver, Colo.
 - 484,021. Process of Recovering Metals from Copper Alloys. Malvern W. Iles, Denver, Colo.
 - 484,033. Process of Extracting Nickel from Ores. Thomas Macfarlane, Ottawa, Canada.
 - 484,081. Antifriction Alloy. Turner D. Bottome, Hoosick, N. Y.
 - 484,161. Melting Pot. Roger S. Pease, Rose, Minn.
 - 484,237. Continuous Kilm. William Radford, San Jose, Cal.
 - 484,239. Reduction of Complex Ores. William C. Wetherill, Joplin, Mo.
 - 484,238. Lining for Bessemer Converters. Carl W. Bildt, Worcester, Mass.
 - 484,328. Furnace for Metallurgical Purposes. John N. Lauth, St. Louis, Mo.
 - 484,329. Furnace for Metallurgical Operations. John N. Lauth, St. Louis, Mo.

PERSONALS

Capt. H. A. Olney, mining engineer of Lynchburg, Va., has been engaged to take charge of the development of the Mesaba Iron Mining Company.

Mr. Mark B. Kerr, the civil and topographical engineer of California, has gone to Ecuador to spend several months. His mission is to introduce hydraulic mining in that country.

Mr. Wm. E. Harris, for the past thirteen years superintendent of the Granite Iron Rolling Mills of the St. Louis Stamping Company, has resigned from that company to accept a like position with the Falcon Iron and Nail Company, of Niles, O.

Mr. Walter H. Dounce has resigned the superintendency of the Operating Department of the American Gold Mining Company, and will leave Uray, Colo., shortly for Kingston, Jamaica, where he will recuperate after several years steady work.

President Osgood, of the Colorado Fuel Company, is now in the city to arrange details of consolidation of his company with the Colorado Coal and Iron Company. The necessary proxies to ratify the consolidation agreement have been secured by the management of each company. Mr. Osgood reports that the business of both companies is increasing.

Mr. Thomas G. Hodgkins, of New York, has given \$100,000 to the Royal Institute of Great Britain to be applied to scientific research. Thomas G. Hodgkins is a wealthy retired merchant living at Setauket, L. I. He is 89 years old and has been a great student all his life. Last year he attracted national attention by making a cash gift of \$200,000 to the Smithsonian Institution at Washington. Half of this amount was presented without restrictions, save that it was to be used, like the gift from the founder of the institution, for "the increase and diffusion of knowledge among men." The income of the other half was to be applied to the diffusion of more exact knowledge in regard to the properties of air and its relation to the physical and intellectual welfare of mankind. This was to be effected by the offering of premiums for discoveries and assays, for which competition was to be open to the entire world, or by such other means as might appear to the regents of the institution as calculated to produce the most beneficial results. Mr. Hodgkins was born in England, and his gift to the Royal Institute of Great Britain is therefore a natural acknowledgment to his birthplace.

OBITUARY.

Henry B. Tatham, one of the firm of Tatham & Brother, lead pipe manufacturers of Philadelphia and this city, died on the 10th inst., aged 75 years. Mr. Tatham was born in Philadelphia. With his four brothers—George N., William P., Charles B. and Benjamin Tatham—about the year 1840, he began the manufacture of lead products.

Captain Edward Maguire, of the United States Corps of Engineers, died in Philadelphia, Pa., on the 10th inst. Captain Maguire was born in Tennessee 46 years ago and graduated from West Point in 1867. He held several prominent positions in the Engineer Corps, and several years ago published a book on "The Attack and Defense of Coast Fortifications." He was the engineer officer under General Terry in the campaign against the Sioux Indians succeeding that of the battle of Little Big Horn, in which General Custer was killed.

SOCIETIES

The Montreal Microscopical Society held its annual meeting at Montreal on Monday, October 11th, Mr. J. S. Brown, the president, presiding. The officers elected for the following year are Dr. Goodwood, president; Dr. Sterling, vice-president; J. G. Shaw, secretary, and J. S. Shearer, treasurer.

INDUSTRIAL NOTES.

The Crescent Steel Works, Pittsburg, Pa., has announced a reduction of 10% in the wages paid to employees. The reduction, it is said in the notices, will take effect October 20th. The company employs about 800 men.

The Illinois Pure Aluminum Company, successors to the Cincinnati Pure Aluminum Company, manufacturers of aluminum articles, will start their new factory at Lemont, Ill., in November. Among other manufactured articles they will make cooking utensils.

H. K. Porter & Co., of Pittsburg, Pa., manufacturers of light locomotives, have issued a new catalogue containing quite a large number of additions and useful information. Among other information, considerable relating to compressed air locomotives is included.

The Corning Steel Company, Chicago, Ill., manufacturers of sheets and plates, with mills at Hammond, Ind., tested their engine and machinery October 3d, and rolled a few plates. The plant will start up and be in full operation October 10th. The capacity of these mills is 100 tons per day of heavy and light steel sheets.

The Phoenix Bridge Company, Philadelphia, Pa., have been awarded the contracts by the Inter-State Bridge and Street Railway, for a steel and iron bridge to cross the Missouri River, at Omaha, Neb. The structure will cost \$1,000,000. It is stated that several of the larger western railroad systems centering in Chicago, are interested in the new enterprise.

A new Corliss engine of 2,400 H.P. was started at the Fall River Iron Works, Mass., on October 5th. It is of the twin triple expansion type and is said to be the largest in this country. The diameters of its six cylinders are: Two 23½ in., two 30½ in. and two 54 in. Its wheel is 28 ft. in diameter, with 10 ft. ± in. face. The rim of the driving wheel has a surface of 176 in., and is covered by four belts—one 38 in., two 44 in., and one 50 in. in width. They are all 3-ply belts.

The St. Louis Stamping Company, of St. Louis, manufacturers of tin plate, are rolling all their black plates from billets made in Jonet and Belleville, Ill., and in Pittsburg. They have now in operation four sets of hot rolls and four cold rolls. The additions to the tin mill are now almost completed, when they will have six sets of hot rolls and twelve cold rolls. The capacity will then be increased to 800 boxes plates per day from 400 as at present. The tin used comes from Australia or from the East India Islands.

Mr. James B. Stanwood has lately brought out a pamphlet entitled "A Ready Reference for Engineers and Steam Users." The primary object of the pamphlet is no doubt to advertise the engines made by Houston, Stanwood & Gamble, of Cincinnati, O., and to explain the scientific principles on which they are constructed. It contains in addition, however, such a quantity of useful information with regard to the teachings of practice in the designing of engines that it is really worth the price charged for it, viz.: 25 cts.

The report of the Bureau of Statistics for August shows that the value of imports of merchandise into the United States for that month was: Domestic, \$61,189,228; free of duty, \$99,411,019; total, \$160,600,247. In August, 1891, the value was: Domestic, \$50,040,919; free of duty, \$99,312,081; total, \$149,352,999. For the eight months ending August 31st, this year, the total value of imports of merchandise was \$880,421,082, against \$900,641,411 in the same period the previous year. The exports of domestic merchandise in August amounted to \$63,501,520, or which \$12,088,886 were of manufactures. In August, 1891, the exports were \$1,424,913, manufactures being \$13,514,494. Exports for the eight months ending August 31st, aggregated \$691,402,061; in the same period last year, \$640,850,100. The imports of gold and silver coin and bullion in August were \$1,933,130; exports, \$9,411,552.

The Belgian State railways have for five years been testing the relative values of metal and wooden ties. Two kinds, weighing about 165 lbs. each, have been tried with rails weighing 76½ lbs. a yard, the ties being about 2½ ft. apart, center to center. Official reports of the tests state that it was very difficult to keep the track laid with them in good shape, particularly as the stone ballast under them was gradually pulverized. The ties themselves were much damaged after five years' wear by cracks starting from the bolt holes. Up to the time of making the reports from which these facts were taken, the track with the metallic ties had cost for maintenance about nineteen times as much as track with creosoted oak ties, and many of the metal ties are so damaged that they must soon be removed. These results when taken in connection with the fact that the Pennsylvania Railroad Company recently abandoned all further use of metallic ties, seem to prove quite conclusively that the future for such ties is small.

The overhead railway system of Liverpool, is nearly completed. It traverses the whole length of the docks, about six miles. The road is to be worked by electricity generated at a station, and carried north and south along the track by a steel conductor. The motors are not placed upon a separate locomotive, but are carried by the passenger cars themselves. A train will consist of two cars, each seating fifty-six passengers, and provided with a motor at one end. The cars contain compartments for first and second-class passengers, with through communication from end to end of the train under the control of the guard. A train loaded with passengers will weigh about forty tons. The train will be lighted by electricity, and will begin running with a five-minute service of trains, though it will be capable of working a three-minute service. The journey from end to end, inclusive of stoppages, will be performed in half an hour. There will be thirteen stations along the route, and the total cost, including equipment, is about \$420,000 a mile.

MACHINERY AND SUPPLIES WANTED AT HOME AND ABROAD.

If any one wanting Machinery or supplies of any kind will notify the Engineering and Mining Journal of what he needs, his "Want" will be published in this column, and his address will be furnished to any one desiring to supply him.

Any one wishing to communicate with the parties

whose wants are given in this column can obtain their address at this office.

No charge will be made for these services.

We also offer our services to foreign correspondents who desire to purchase American goods, and shall be pleased to furnish them information concerning goods of any kind, and forward them catalogues and discounts of manufacturers in each line, thus enabling the purchaser to select the most suitable articles before ordering.

All these services are rendered gratuitously in the interest of our subscribers and advertisers; the proprietors of the Engineering and Mining Journal are not brokers or exporters, nor have they any pecuniary interest in buying or selling of goods of any kind.

Goods wanted at home.

2,806. Stave and hoop making machinery. Virginia.

2,807. A small planer and matcher suitable for light custom work; also a saw gummer. Virginia.

2,808. Filter press and steam pumps for oil refining. North Carolina.

2,809. 500 ft. 20 or 30 lbs. second-hand T rails. Virginia.

2,810. A 36-in. swing by 16 ft. bed engine lathe, a 24-in. back gear drill press, and a heavy universal milling machine. Mississippi.

2,811. A second-hand lathe, sufficient to handle 15 ft. shafting, a 50-in. by 30-in. by 5 ft. planer, and a power drill press. Mississippi.

2,812. Machinery for a 5 to 10 ton ice plant. Virginia.

2,813. Machinery for manufacturing 100 to 200 bales cotton a year into cotton rope. South Carolina.

2,814. A quantity of 2½ in. and 4 in. second-hand wrought iron pipe in good condition. Alabama.

2,815. Detailed estimate and full particulars for an inexpensive pumping plant for irrigating purposes. Power to be supplied by a gasoline, naphtha or kerosene engine. Capacity of pump to be 1 cu. ft. per second, with lift of 60 ft. Washington.

2,816. A wood splitter. Virginia.

GENERAL MINING NEWS.

ALABAMA.

Cleburne County.

(From our Special Correspondent.)

I have recently visited the Alexander banks of brown hematite ore located in this county, and owned by the Augusta Mining and Investment Company, of Cedar Town, Ga. The property consists of 80 acres of mountain, the apex being about 400 ft. higher than the surface level of the adjacent country. A standard gauge switch about 1½ miles in length has just been completed from Bowen's Station on the East & West Railroad, of Alabama, to connect these banks with that road for shipping purposes. From this point to the works, located near the summit of the hill, a narrow gauge tram road has been built 1½ miles in length, of a horse-shoe shape, and very heavy grade. Development work has been commenced at three openings in the hillside; these open cuts have been quarried back on a level until the face of each is about 40 ft. high, and the ore taken out lies piled upon docks, erected for the purpose, awaiting the completion of the tram road, when it is expected heavy shipments will be made. Iron is now laid on this tram road to within a short distance of these docks, and the work is being prosecuted vigorously. The deposit of ore in this mountain, so far as quantity is concerned, would, from the openings I visited, warrant the assertion that it equals the famous Baker Hill which is considered the largest deposit of brown ore in Alabama. In quality, although I saw no analysis, I should judge from its appearance that it would average well with the Baker Hill ore, carrying about the same percentage of phosphorus, which will render it only useful for treatment in coke furnaces. It is a pretty well established fact that the brown ore deposits in this section rest on limestone; the depth of limestone in the vicinity of Baker Hill may be said to average about 70 ft. below the valley surface. This was demonstrated in sinking a well on the Tecumseh Iron Company's property a few days since, about one mile from Baker Hill bank. At the Alexander bank the claim is made that limestone lies much deeper; if this proves correct then the Alexander bank, judging from present indications where work has been performed, will eventually prove to be one of the most extensive in depth of brown ore deposits in Alabama. But it is not safe to predict extent in these deposits because horses of both rock and clay are so frequently and unexpectedly encountered, cutting of the ore. That the Augusta company is showing great faith in the extent of this deposit is proved by the amount of money they have and are still expending in work preparatory to shipping. Mr. Lem. Johnson, the foreman of the Alexander banks, informed me the estimated cost of preparatory work was \$18,000. A regulation, double-logged ore washer of the old type, is to be erected on the hillside near one of the open cuts, which shows the deposit at that point to be chiefly gravel ore. In the other cuts the formation is more solid, and in one this is especially the case. This company, which I understand is composed largely of New York capitalists, will, if it carries out its present policy, prove of vast importance to both Georgia and Alabama. Its present programme, as I am informed, is to lease the Cherokee Iron Company's coke furnace

at Cedar Town, Ga., also to purchase and complete the furnace in course of erection at Piedmont, Ala., as well as to purchase the East & West Railroad, of Alabama, which was originally built by the Cherokee Iron Company and sold to the present railroad company, but it is to-day in the hands of a receiver. This road connects Cedar Town, Ga., and Piedmont, Ala., with its present terminus about 40 miles east of Cedar Town and west of Piedmont. A valley farm of about 100 acres at the base of the Alexander Hill has been bargained for by the company to afford facilities for dumpage trackage, etc. This company also own and operate the Reed Bank, in Polk County, mentioned in my correspondent in Engineering and Mining Journal of September 24th, which through some error was credited to and located in Cherokee County, Alabama.

ALASKA.

Alaska Treadwell Gold Mining Company.—The output of this company for September was as follows: Shipment of bullion, \$61,300; tons of ore milled, 19,045; tons of sulphurets treated, 474. Of bullion there came from sulphurets \$16,340. Gross expenses for period have been \$25,500. The profit available for dividends earned during the first four months of the present fiscal year (ending September 30th) amounts to \$137,000. The regular dividend absorbs \$100,000 of this sum.

ARIZONA.

The following are the monthly statements of Arizona mining companies listed on the San Francisco Exchange, showing financial condition on the 1st inst.: Cash: Croker, \$1,066; Peer, \$496; Peerless, \$1,796. Indebtedness: Silver King, \$4,340.22, with 1 1/2 tons of concentrates unsold.

CALIFORNIA.

(From our Special Correspondent.)

A decision rendered by Judge Choert in the United States Circuit Court yesterday, in the case of the United States vs. the North Bloomfield Gravel Mining Company, is of the utmost importance to hydraulic miners. By the terms of this decision permission is granted the mining company to resume work. The operations at the mine were stopped by an injunction granted by the Circuit Court in the somewhat noted case of Woodruff vs. the North Bloomfield Mining Company, in 1884. In the decree it was intimated that if the company could show that it had constructed impounding reservoirs which would successfully impound the mining debris, the decree might be modified. Such a showing has been made. The question of fact decided was whether or not, with the use and operation of the impounding works, mining debris escapes from the mine into the navigable waters of the Yuba, Feather, or Sacramento rivers so as to impair or injure their navigability and whether the construction and operations of the impounding device was complete in the face of the three objections urged against its operation: First, that it does not successfully removed from the water the material carried in suspension, and that the water escaping by the cribs takes with it material which becomes deposited in the lower streams, impairing their navigability. Second, that the dam across the excavation is not of durable material and is liable to break. Third, that the cribs are liable to break or decay.

A personal inspection of the reservoir and rivers was made by Judge Gilbert, who found that the fine clay held in suspension in the water is of a specific gravity little greater than water, and remains in suspension so long as the water moves with a velocity of one mile in 2 hours, and is thus carried to the ocean. He held that no danger could be apprehended from the insufficiency of the dam which presents a wall nearly 100 ft. high, and is a compact, solid mass of gravel, sand and clay interwoven with brush. The mass appears to be now in process of reconstruction, and solidifying, and has, to some extent, been restored to the condition of the material in the surrounding hills. There is no danger from winter torrents, and if it should break, the impounding material, if it moved at all, could only escape into the new impounding reservoir. The court further held that there is no danger to the navigability of the streams from the breaking, decaying or destruction of the cribs. These in time will decay, but will outlast the use of the pools for impounding reservoirs. By that time the impounded material must have become compact and solid, so that the caving in of any portion of it need not be expected, and if it should so happen the result would be simply to choke up the shaft and permanently close it. Judge Gilbert in concluding said that the contingency having arisen that was contemplated in the original decree he did not feel justified in enjoining the use of the property and thereby interdicting a valuable industry. The North Bloomfield Company, operating in Nevada County, owns property which is a consolidation of many claims, the whole aggregating 1,535 acres. Large sums of money have been expended in developing the mine, over \$500,000 having been expended for 45 miles of ditching alone, and a further sum of \$250,000 for a reservoir. The gravel is about 135 ft. deep, some of it having so cemented that it cannot be washed until blasted. The gold obtained is of a "shotty" character, varying in fineness from 898 to 936. From January, 1876 to January, 1884, the mine

was worked as an open hydraulic, the output amounting to \$2,000,000. In the latter year the company were enjoined and have since remained closed except as worked in a limited and expensive manner.

Butte County.

The following items are taken from the Oroville "Register": "The shaft on the Banner mine is now down over 400 ft. It is a 6 x 10 shaft with a double compartment. It will be sunk to the 500-ft. level before any crosscuts are run to strike the lode. The formation which has heretofore been dipping toward the mountain has now turned toward the river and experienced miners believe this is a good indication. From the Hay & Clark mine at Bangor there has been taken \$6,000 in gold dust, while the total expenses have been about \$5,000, leaving \$1,000 net profit. The channel where this company is working is 400 ft. wide and the gravel is 17 ft. thick.

Mono County.

The following are the monthly statements of Bodie mining companies, showing financial condition on the 1st inst.: Cash on hand, Syndicate, \$1,418; Bodie Consolidated, \$13,810; Bulwer, \$13,427; Mono, \$1,502; Standard Consolidated, \$21,980. Indebtedness, Summit, \$2,928.

Bulwer Consolidated Mining Company.—The latest official weekly letter says: "During the past week the upraise from No. 5 was extended 15 ft. Track was put down in east crosscut, south end of mine, and work commenced in face. The work of rebuilding the main ore chute is finished and it is now in good condition. We shipped to the Carson Mint, September 27th, bullion valued at \$7,632.81."

Standard Consolidated Mining Company.—At the San Francisco office of this company a bullion shipment valued at \$20,698.16 has been received, which was the product of the mine for the month of September.

Plumas County.

(From our Special Correspondent.)

Crescent.—According to the Plumas County "Bulletin," a body of ore has been struck in this mine on the 400-ft. level, in the drift running in a southerly direction from the shaft. The body of ore is what is known as the Horseshoe vein, and it is about 10 ft. wide. It is low grade as yet. At the mill 24 stamps are now running steadily. The development just made is of great importance, as it proves that the veins in that section go down. This is said to be the deepest quartz mine in the county.

San Bernardino County.

(From our Special Correspondent.)

San Jacinto Estate Ltd., Temescal.—The closing down of the tin mines continues to be discussed but no authoritative explanation has been given of the reason for such action. No visitors are allowed to make an inspection of the property, and, although it has been sought to make political capital out of the fact that the mines have closed down it is becoming generally known that whatever the causes may be they must be looked for in London rather than in this country. The report circulated some time ago regarding the swindling of the stockholders, and that almost \$2,500,000 had been sunk in the property, is strenuously denied here; the allegation is that not \$800,000 has been expended, and the ranch, apart from the mines, is worth a much larger sum. About eighteen months ago there was a struggle among the stockholders in England for the management of the mine and it is thought that in closing down the mine a policy of "freeze-out" is being followed, thus repeating what has occurred on the Comstock over and over again. Meantime the local management have nothing to say and use every endeavor to keep all information regarding the mine from leaking out.

Silver King Mining Company, Limited.—At the Red Cloud, the stope in the west drift is falling off while the east end is improving. So far 3 oz. is highest assay. At the Mammoth the report is "no large body of ore at present," but small amounts are being taken from old stopes. At the other mines, viz., Garfield, Hunters and Odessa, the report is the same, i. e., small amounts of low grade ore.

Sierra County.

Bald Mountain Extension.—The Downieville "Messenger" says that orders have been given to close this property, owing to a difference with the miners in regard to wages.

COLORADO.

El Paso County.

Work has been commenced on the foundations of the 100-stamp mill on Four Mile, and the buildings will be pushed ahead as rapidly as possible. At a depth of 80 ft. in the Temony tunnel a rich vein of quartz was encountered on the 1st inst. It has been found to be at least 3 ft. wide. Grading on both the Colorado Midland Railroad branch to the town of Midland and on the line of the Colorado Terminal Railroad, on the narrow gauge from that point into Cripple Creek, is progressing as fast as could be expected. The contractors are bound by a heavy penalty to have both roads completed not later than December 20th. It is believed that a branch of the Denver & Rio Grande Railroad also will be built into this camp either from Florence or Canon City before January 1st. The revenue

to be derived from the construction of this branch will warrant it is said, the company in building. The shipping mines at present are: Anaconda, Victor, Matao, Strong, Pharmacist, Buena Vista, Summit, Plymouth Rock, Deershorn, Mountain Boy, Eclipse, Gold King, Work, Blue Bell, Ophir, Auqua and Sweet. With cheap railroad transportation this number will be double by March 1, 1893. There is at present three stamp mills working in the district, one of 20 stamps, in Beaver Park and two on Cripple Creek of 10 and 15 stamps respectively. All three mills have ordered machinery to double their present capacity. There are two Huntington mills, one treating quartz ores and the other placer dirt, and both are doing good work. New stamp mills will be erected on Barnard, Spring, Wilson, Gassy, Cripple and Four Mile creeks, and it is safe to say that at least 250 stamps will be working on Cripple Creek ores by January 1st. A contract has been let for the erection of a 100-stamp mill at the head of Four Mile Creek, which by the terms of the contract will have to be in running shape by December 1st.

Deershorn.—This mine on Cripple Creek has been sold to T. F. Walsh and associates of Denver, and Kokomo. Messrs. Eastman and Smith received \$40,000 for the property. A large force of men has been put to work in lodes Nos. 1 and 2.

Lake County

(From our Special Correspondent.)

Bi-Metallic Smelting Company.—The construction of two new stacks will begin in a short time, besides other improvements in the way of new ore bins and a large dust chamber. The new furnaces will be of 100 tons capacity each and will be modeled after the one now in use. The dust chamber will connect the furnaces with a huge brick smokestack, the erection of which will begin in a short time. The saving of this dust, it is claimed, will greatly add to the profits of smelting. By these improvements the smelting capacity of this plant will be increased to 300 tons daily. This smelter is now treating 900 tons monthly of ore from the Amethyst mine at Creede, besides its home supply.

First National Mining Company.—A large block of this stock was disposed of a few days ago in order to procure the necessary funds to continue development work during the winter. The attention of the operators will hereafter be turned to the lower workings, where it is thought there is more chance of catching one of the large chutes from across the gulch. The upper workings are now being developed upon an economical scale and some first-class ore is being mined and shipped.

Gray Eagle Consolidated Mining Company.—All five shafts of this company's property are working steadily, although at present the work consists of repairing and renovating the shafts and workings. At the Sixth Street, three more sets of timbers will necessarily have to be put in before development can ensue. This will then have completed the work of retimbering the shaft from the 410 foot level down. The water is giving but little trouble, being now held at the bottom of the shaft. A new station is to be cut at the 550 ft. level of the Penrose shaft, into which will be placed a compound pump of 1,200 gallons capacity. A new boiler of 80 H. P. has just been put in at this point, which increases the steam capacity to nearly 600 H. P. Pumping at the Bohn shaft is to be resumed during the coming week, by which time a large new pump will have been put in at the lower level. At the Grey Eagle shaft some good carbonate and iron ore is being shipped from the 400 ft. level south, and a drift is being run to connect with the Pocahontas shaft in order to procure a more perfect system of ventilation. The Pocahontas is shipping 50 tons daily of good carbonate ore, which is mined principally from the 400 ft. level west. The working force is to be added to shortly and the output will accordingly be greatly increased.

Holden Smelting Company.—Is building a water flume from the Bohn shaft to the smelter. The flume is nearly two miles long and over 200,000 ft. of lumber is consumed in its construction.

Jay Bird Mining Company.—A 20-ft. vein of gold ore was opened up during the week at the Jay Bird, in the new tunnel recently started at that property, at a point 40 ft. from its adit and 20 ft. from the surface of the ground. The vein appears to extend directly into the Grover Cleveland ground adjoining, and work on the latter will be resumed at once in order to catch an extension of the new strike, if possible.

Little Joe Mining Company.—Eastern parties interested in this claim are now in the city making arrangements to continue development work during the winter. The strike of gold ore made at that point recently has turned out much better than at first expected. In prospecting the hanging wall a few days ago a quantity of dirt fell, revealing an enormous body of high grade ore lying above. The ore sheds are now almost completed and the first shipment will be made in a few days.

Robert E. Lee Mining Company.—In the Crawford-O'Neil lease on this property, a strike was made yesterday afternoon of chlorides, which runs very high in silver. The size of the body is not yet known, as but little work has been done since that time. Development work is to be resumed next

week, however, and arrangements to begin shipping will be made at once.

Silver Queen Mining Company.—A vein 4 ft. in width, consisting of very fine sulphides, was opened up at this property a few days ago. Through the center of the vein there is a small streak of black sulphurets running over 500 oz., which increases the average value of the whole to over 100 oz. per ton, sixty tons of this material have been shipped during the past week and another large shipment is to be made in a few days. A shaft is also to be sunk from the surface shortly in order to develop the ore body from above and below at the same time.

Venture Mining Company.—The work of draining this claim is still progressing favorably and the water will be out during the coming week. While inspecting the first level south recently, a piece of ore was accidentally found in the breast which assayed 368 oz. silver, 8-10 of an oz. of gold, and 35% lead to the ton. This drift is to be prospected immediately in quest of the main vein from which this piece of ore originated.

San Miguel County.

Shipments of ore and concentrates from Telluride for the week ending October 1st were: From Sheridan Consolidated, 17 cars; Smuggler-Union, 37 cars; Hector, 2 cars; Montana, 1 car; total, 87 cars. Total shipments since January 1st, 2,507 cars.

IDAHO.

Bear Lake County.

A new district twenty miles north of Montpelier promises to become of much importance. Some of the ore contains 75 to 80% lead. A carload of ore from the Blackstone netted \$750, and two carloads more of the same kind of ore are ready for shipment. The North Star group is being rapidly developed. About 350 ft. south of the North Star group is the Pluto, which is being developed by a 75-ft. shaft, at the bottom of which hard carbonates have been found.

Boise County.

Gold Hill Mining Company.—The twenty-five-stamp mill continues running day and night. The company is sinking the shaft 100 ft. deeper, as the upper levels are about worked out. The ledge in the lower works is 60 ft. wide, all of which is milled.

Owyhee County.

Cliff.—The tunnel is now in 200 ft., the pay streak of the ledge varying in width from 4 in. to 12 in. It is claimed that the value of the ore is increasing with depth.

Poorman Mines, Limited.—During September the output was 280 tons of ore, yielding \$15,950. The manager reports the mines as looking well.

Ralph Mining Company.—A Silver City dispatch states that this company has let the contract for a 30-ton mill. This company's property consists of the Ralph, Ruth, Hoyt, Farming Hill and War Eagle mines.

Silver Vault.—A tunnel has been run a distance of 200 ft., at the face of which a perpendicular shaft is being sunk and has now attained a depth of 60 ft., the entire depth being through quartz. At the face of the tunnel, or at the point where the shaft is being sunk, the ledge between walls is nearly 12 ft., having porphyry for the foot and an iron dike for the hanging wall. Assays have averaged \$50 to \$250 per ton, the greater portion being silver.

Shoshone County.

The Stemwinder company has completed a wagon road up to the mine, which greatly facilitates travel in that direction. The mine and mill of this company are now working full handed, night and day.

Preparations are going on at the Sierra Nevada for extensive developments. Heretofore the company has been restricted to certain ground by reason of an injunction from the United States Court by the owners of the Apex. All this has been set aside and the property will be worked on a more extensive scale.

Bunker Hill & Sullivan Mining Company.—This company employs 400 men and is shipping 125 tons of concentrates per day. No delay or interruption has been met with on account of accidents, and plans are in progress for increasing the capacity of the property.

Coeur d'Alene Silver Lead Mining Company.—President Clark reports a great many union men at work in the Poorman, but none of them had any connection whatever with the recent trouble. From 200 to 230 tons of ore are being taken out of the Poorman per day. It runs about 55% lead and from 28 to 30 oz. silver.

ILLINOIS.

Statistics given out by the Bureau of Labor Statistics of Illinois show the daily wages of coal miners in that State have increased 15.6% during the year.

IOWA.

Polk County.

Every miner in Polk County is out on a strike, and all the mines are idle. All the mines except that operated by the Des Moines Coal Company have conceded the 10% advance of the miners, but refused the bi-weekly payment demanded.

KANSAS.

Cherokee County.

During the week ending October 8th the output of ore from the mining districts of Galena and Empire City was: Rough ore, pounds milled, 2,425,340; rough ore, pounds sold, 1,222,610; zinc ore, pounds sold, 1,079,180; lead ore, pounds sold, 150,830. Sales aggregated a total value of \$14,786.

MICHIGAN.

Copper.

Centennial Mining Company.—The No. 3 shaft, on the conglomerate, was sunk 93 ft. during September. Although there is scarcely any lode here, the shaft has been passing through a rich bunch of amygdaloid.

Tamarack, Jr. Mining Company.—Captain Daniell, of the Tamarack, Jr., Mine, writing under date of Oct. 3, says that during September he drifted in the fourth level south of cross-cut in the No. 1 shaft, for a distance of 51 ft.; that some copper was opened up, but that it was not valuable. The drift has, however, improved during the last few days. Should now stake the copper ground which has been persistent in third level. The third level south of the No. 1 shaft was drifted 46 ft. and is all in good stopping ground. At the No. 2 shaft 38 ft. were drifted north in September, making 133 ft. from the crosscut, and south 38 ft., making 135 ft. from the crosscut. Find the conglomerate from 3 ft. to 10 ft. wide, carrying occasionally some fairly good copper rock, but on a whole nothing to value.

Houghton County.—The Board of Mine Inspectors report that for the year ending September 30th 7,640 workmen were employed in the copper mine. There have been only 21 fatal accidents, six of these due to carelessness of miners killed.

Iron—Marquette Range.

Jackson Iron Company.—Another serious cave-in has occurred at the mine.

Iron—Menominee Range.

Aragon Iron Company.—Superintendent Larson reports the mine as getting better as the work advances under the swamp; 140,000 tons have been extracted this year to date.

Ludington.—Preparations are now under way, says the Norway "Current," to unwater this and the Hamilton mines. There are now two large bailers at the Hamilton, and two more will be put in at the Ludington. Both mines are now controlled by Mr. P. Kimberly.

Coal.

Calumet and Hecla Mining Company.—This company is to have 85 castings of 20 tons each made by the Lake Superior Iron Works. They will serve as anvil blocks in the new stamp mill. Five pieces weighing 100 tons form one complete block.

Tamarack Mining Company.—It is estimated that by July, 1894, No. 3 and 4 shafts of this mine will be ready for use, and that the company will then practically have two mines—the new one four times as large as the 80-acre section now being worked. No doubt is felt that rich rock lies beneath the shafts now being sunk, says the Boston "Herald." It is observed by the annual report that the fund for completing these shafts was practically exhausted June 30th, which is true. Nor will the company issue new stock or create a mortgage to supply money. It will take it rather from the surplus or from current income. The cost of completing the shafts will be about \$10,000 a month, say \$250,000, from July 1st last, a sum equal to \$5 per share on Tamarack stock.

MINNESOTA.

Duluth, Oct. 13 (by telegraph).—It is reported that the Gunflint Lake Iron Company in stripping for iron ore, near Gunflint Lake, discovered a vein of nickel ore 8 to 10 ft. wide. It is stated that a preliminary assay showed 9% nickel.

Iron.

Shipments of iron ore from Two Harbors up to and including Wednesday, Sept. 28, aggregated 953,132 gross tons, of which 549,829 tons were from the Chandler, 394,754 tons from the Minnesota, 2,525 tons from the Pioneer and 9,024 tons from the Zenith mine. On the same date shipments from Ashland aggregated 1,821,753 gross tons, divided among the different mines as follows: Ashland 165,120 tons, Aurora 256,294, Colby No. 1, 3,759, Colby No. 2, 51,850, Rand 17,700, Tilden 184,783, Iron Belt 128,948, Montreal, south vein, 3,383, Montreal, north vein, 27,527, Palms 52,205, Section 33, south vein, 4,619, Section 33, north vein, 3,133, Anvil 1,696, Brotherton 88,620, Comet 33,707, Carey 28,063, Newport 104,262, Imperial 5,803, Norrie 347,959, East Norrie 166,619, Odanah 3,193, Pabst 44,447, Eureka 6,675, Sunday Lake 41,684, Windsor 26,673, Jack Pot 2,717.

Iron—Mesaba Range.

The lease of 2,500 acres of iron lands in Itasca County has been completed by ex Governor Campbell, J. H. Baker and F. Barrett, in the interest of the Buckeye Iron Company.

Ohio Iron Company.—This company has sold its lease of the Ohio mine to the Kimberly syndicate. The consideration was \$105,000.

MISSOURI.

Jasper County.

(From our Special Correspondent.)

Joplin, Oct. 10.

The output of ore from the lead and zinc mines for the week ending Saturday was much below the

average. As the zinc ore market has a downward tendency some of the large producers are taking out but little ore at the present, and are waiting for an advance. The top price paid last week was \$23.50 for extra clean high grade ore, while the average of the entire district was \$21.50 per ton. It is estimated that there is not less than 2,500 tons of surplus ore in bins at Webb City and Cartersville; there are also large amounts at Joplin, Zincite and Tanyard Hollow. Lead ore is also on the decline, and closed at \$22 per thousand. Following are the sales: Joplin mines, 1,567,030 lbs. zinc ore and 200,470 lead; value, \$20,864.15. Webb City mines, 679,770 lbs. zinc ore and 15,259 lead; value, \$7,428.60. Cartersville mines, 527,130 lbs. zinc ore and 189,800 lead; value, \$9,923.45. Zincite mines, 259,680 lbs. zinc ore and 2,710 lead; value, \$3,015.90. Lehigh mines, 85,860 lbs. zinc ore; value, \$987. Oronogo mines, 84,050 lbs. zinc ore and 114,010 lead; value, \$3,246. Carthage mines, 208,800 lbs. zinc ore and 15,000 lead; value, \$2,860. Alba mines, 42,200 lbs. zinc ore; value, \$464. Galena, Kans., mines, 1,079,189 lbs. zinc ore and 150,830 lead; value, \$14,786. District's total value, \$63,005.15. Aurora, Lawrence County, mines, 420,000 lbs. zinc ore, 826,560 lbs. silicate and 170,000 lead; value, \$14,139. Lead and zinc belts, total value, \$77,744.15.

The Victor mine, south of Casterville, recently purchased by parties from Toledo, O., have just completed the general overhauling of their old plant of machinery and have finished their new concentrating mill, all of which will start up to-day. This mine has been one of the noted producers of the Cartersville district and the Toledo parties paid \$100,000 cash for the property. It has been carefully estimated that there is ore enough blocked out and in sight to keep the new plant running steady for one year or more. The Cherokee mine, adjoining the Victor on the southeast and operated by St. Louis parties, is running steady. Their ore bins are full, holding for better prices. The Rex Mining and Smelting Company's 1,000 acre tract is still the favorite for prospectors in the Joplin district; several new strikes of both lead and zinc ore were made last week. The Bell Boy mine have their new concentrating plant almost completed and will soon be running; they have a 30-ft. face of ore to commence stopping on, and will make a large output. Dr. Otis E. Hovey, assistant in the State Geological Survey in charge of the World's Fair exhibit, is now in the Joplin district collecting specimens for the World's Fair.

MONTANA.

Beaver Head County.

Golden Leaf.—This mine and the Bon Accord placer will close down in two weeks, says the Helena "Daily Journal." The former closes down on account of the low grade of the ore.

Deer Lodge County.

Anaconda Mining Company.—The work of driving the gas out of the St. Lawrence mine is progressing satisfactorily and men can now work in almost any part of it without experiencing any disagreeable sensations. Ten-inch galvanized iron pipes have been run through all the levels down to 600, and they will be continued down to the lower workings. Pure air will be continually forced through these pipes and in this way the mine will be kept clear of gas. Everything will be in readiness to commence work again about the middle of next month. Improvements are to be made in some of the syndicate mines and the men who are laid off there will be put to work in the St. Lawrence.

Bi-Metallic Mining Company.—A new shaft has been started about 400 ft. north of the Zeus. It is now down about 50 ft.

Granite Mountain Mining Company.—The latest news of this company is to the effect that all the men except those employed in the mine proper and mill have been laid off. No prospect work is now being done. The Cleveland shaft, which is down 400 ft., has been discontinued, and the pumps drawn from the levels.

Flathead—Coal.

Solid croppings, 3 ft. in thickness, of mineral wax were discovered recently on a homestead claim adjoining the Columbia Falls' townsite, says the Butte "Inter Mountain." It resembles hardened pitch, black or brownish black in color. It is without cleavage and of flinty fracture. The mineral is streaked with reddish brown. It burns with a crackling noise, with a bright flame when lighted with a match, and gives out an odor resembling that of a common kerosene lamp. While burning it softens and becomes waxy, and can be cut into fine ribbons or shavings, which, when burning, can be cast about through the air and dropped without extinguishing the flame.

Alph Shipley, of Flathead, has just finished making a further examination of the coal fields. He says that they are of considerably greater extent than is generally supposed, as they stretch from near Columbia Falls, which are now being worked by the Northern International Improvement Company, for many miles to the northeast in the valley of the north fork of the Flathead. The veins worked by the above company, eight in number, are the bottom veins, so far as discovered, of the coal measures. The veins pitch to the northeast and strike northwest and southeast. At Columbia Falls the pitch is about 45°, but toward the eastward the veins flatten out. Along the strike of the veins the coal

the Court. It looks as if Major Eagan will have some difficulty in persuading the Court or the public that he was the scapegoat he alleges.

Justice Mining Company.—The ore in the north stope, 822 level, which ranges from 2 to 3 ft. wide, runs, as per car sample, \$25 to \$32 per ton.

Overman Silver Mining Company.—From the northwest drift, 1100 level, an inclined upraise, No. 5, has been started and extended 32 ft. on a seam of ore $3\frac{1}{2}$ to $4\frac{1}{2}$ ft. in width, and the seam shows bunches of sulphuret ore.

Silver Hill Mining Company.—The Justice mill is kept busy running on ore from this mine. It will take about six weeks longer before a clean up is made. A streak of ore on the 490 level, $2\frac{1}{2}$ ft. wide, the ore assaying to \$50 per ton, is being stoped out. When the mill has ceased running a concentrating plant will be put in, and then the mill will start up on New York ore.

White Pine County.

White Pine District.—The ore shipments for September were as follows: From Thomas Cornell's mine, 60 tons; Rocko Cragnazo, 60 tons; Ross & Siri, 35 tons, and miscellaneous, 24 tons.

NEW MEXICO.

Grant County.

Colchis Mining Company.—Work has been suspended on this company's mill at Silver City on account of lack of funds, but an effort is now being made to get the stockholders in the East to furnish the necessary cash to complete the mill.

Pacific Gold Company.—This company is keeping the Mountain Key mill at work constantly, and the mine is producing more ore than the 15 stamps at the mill can handle. The Pacific Gold Company's mill here will be started as soon as the water company can furnish water.

PENNSYLVANIA.

Coal.

The Morea colliery made the largest shipment in its history on the 22d ult., when 601 cars of coal were hoisted and run through the breaker in six hours time. The colliery is working five days a week.

Pennsylvania Railroad Company.—The Philadelphia "Press" publishes the following: "The officers of the Pennsylvania Railroad Company are having surveys made for a number of branch lines to extend into the bituminous region up in the Allegheny Mountains. During the early part of this year the Cambria & Clearfield Railroad was straightened and extended, but since then other coal deposits have been found and the company will have to construct lines to the new coal fields. The first branch line from Cresson is at a point about three miles north of the Carleton tunnel. At this place the railroad company is having constructed a line about two miles long which will bring the road up to the new mine. About two miles further along the main road there are two branches to be constructed, which are to be known as the Powell and Hopple branches. In fact there is only one branch from the main road, but after the new road reaches the Powell tract it returns for a distance almost parallel to the Powell branch, then it forms a switchback and runs to the Hopple district. The Pennsylvania Railroad Company will also extend its lines about two miles further along, to a new mine which is to be known as the Delancey branch. Along Walnut Run there is a railroad for part of the distance, but at present only two miles of the road is opened. This district has a large deposit of bituminous coal, and to reach it the railroad company will extend the road to the upper end of the run, known as the Bluebaker coal district. There is said to be a deposit of over 200,000,000 tons of bituminous coal in this section which will be developed as soon as possible. It is said that the veins in this district are about 14 ft. of good coal, or about 14,000 tons of export coal for each and every acre of land, and as each road reaches an operation of six acres of land it will be seen that a large amount of coal remains to be developed. From Patton Station, on the Cambria & Clearfield road, west, three branch lines will be built along Little Chess Creek, Dry Fork and Flannigan's Run.

Philadelphia & Reading Coal and Iron Company.—It is feared that most of the collieries of this company throughout Shenandoah and Mahanoy Valley regions will be thrown idle within a week because of a scarcity of water to feed the boilers to keep the hoisting machinery in operation. The company's anthracite dam at Shenandoah, upon which half a dozen of the collieries are dependent, is practically dry, and it is necessary to haul water in tanks and barrels two and three miles to keep the Knickerbocker and Ellangowan collieries going. The situation at Mahanoy City is said to be critical. The collieries in and about that town have been dependent upon a process for purifying the sulphur water that is pumped from the mines, but it is said that the boilers using this water are becoming greatly damaged and the process will have to be abandoned. St. Nicholas Colliery is getting its supply in tanks from Mahanoy Plane, four miles distant. The situation at Girardville and Ashland is also very critical.

Sterling.—A terrific explosion of gas occurred at the Sterling mine at Shamokin on the 13th inst. Several men lost their lives, and it is feared that 13 others who are imprisoned in the mine may not be rescued alive.

Oil.

The chief of the Bureau of Statistics reported the total values of the reports of mineral oils from the United States for the month of September, 1892, and during the nine months ending September 30th, 1892, as compared with similar exports during the corresponding periods of the preceding year as follows: September, 1892, \$3,593,968; September, 1891, \$3,950,591; nine months ending September 30, 1892, \$30,441,555; nine months ending September 30, 1891, \$34,127,469.

SOUTH DAKOTA.

Lawrence County.

Bullion.—The parties holding bond on this property intend to thoroughly develop it during the next few months, says the Deadwood "Pioneer." The report of the expert who recently examined the property in the interest of the Colorado syndicate was quite favorable, and if the body of ore now uncovered holds out upon further development, the sale will undoubtedly be made. The bond on the property expires January 1.

Esmeralda.—This property, which has been flooded with water, making mining operations impossible, has been almost unwatered. Active mining operations will be commenced in a short time.

Hawkeye Mining Company.—Construction of the new quartz mill of this company at Pluma has been practically completed, says the Deadwood "Daily Pioneer." Machinery for the new mill, all of the latest improved design, has already been ordered, and its delivery is daily expected. The machinery will be set in position in the building immediately after its arrival, and it is expected that the mill will be in preparation for the commencement of operations by Jan. 1, 1893.

TENNESSEE.

Montgomery County.

The new Gracy-Woodward furnace was built after the plan of the Hattie Ensley furnace, at Sheffield, Ala. It has a capacity of 150 tons a day, and is likely to average 200 tons a day. The Hattie Ensley, built for a capacity of 125 tons, has a record of 201 tons and an average of 173 tons. The estimated cost of mining and delivering the ore at the furnace is placed at \$1 per ton. The fuel supply will come from the coal fields of Western Kentucky, and the cost of transportation is reduced by the competition of the Louisville & Nashville and Ohio Valley railroads.

UTAH.

Cassia County.

Badger.—The owners have sunk to a depth of 30 ft. The ledge continues better all the way. The vein is about 8 in. wide on an average. From the lower works the first assay, at a depth of 5 ft., was $15\frac{1}{2}$ oz. silver, \$3.40 in gold, and 78% lead. Second assay, from a lower depth, was 23 oz. silver and 64% lead. Third assay \$136.92 in gold, 10 oz. silver and 10% lead.

Juab County.

Centennial Eureka Mining Company.—The official statement for the year ending August 31st shows total receipts of \$400,691.88, of which \$54,688.58 was cash balance brought forward and \$333,483 from sales of ore. The total expenditures were \$305,975.62, of which the sum of \$180,000 represents dividends paid. There is on hand a cash balance of \$94,716.26.

Red Rose.—Free gold milling ore has been discovered in an upraise from the long drift. It is reported that the ore body is 3 ft. wide.

Silver Spar.—A tunnel is being run in to cut a vein supposed to be the continuation of that of the Mammoth and Copperopolis. It is now proposed to add a diamond drill to the outfit.

Millard County.

Ibex.—A one-half interest in this and three other claims has been bought by A. G. Campbell for \$20,000. On the Ibex the tunnel is in a considerable distance all in ore, which averages \$20 per ton in gold. A cross-cut of 25 ft. has not touched the walls. Tests of the cyanide process have been made. A test with the rock crushed to the fineness of 50-mesh, but 50% of the assay value was saved, but when finer or 100-mesh, 92% was saved. A test of the Crawford mill will be made in a short time.

Salt Lake County.

Chalk Creek Coal Company.—This company is making active preparations to commence shipping coal this winter. Two new boilers and pumping machinery are being put in at the double compartment shaft, and two shifts of men are at work clearing the mine of water. The new appliances will give a producing capacity of 1,500 tons of coal per day, and negotiations are pending by which the coal will be shipped to Salt Lake City by rail in the near future.

Emma Company, Limited.—Mr. H. C. Wood, the superintendent, reports a strike on this property. The ore body is described as being very large and growing larger as development progresses. One hundred tons of this ore has already been extracted. The strike was made in ground 100 ft. south of the end line of the North Star claim.

Niagara Mining and Smelting Company.—Several ore bodies have been opened in new ground this summer, and from now on it is expected that regular ore shipments will be made. Three carloads have been sent within a week. The company is now employing 38 men at the mine and concentrator. The concentrator is running one shift a day of 12 hours.

Starlus.—This mine is yielding large amounts of ore which is not being shipped, but piled up on the dump to await the erection of tanks and other necessary machinery for treating it by the cyanide process, which will be put up about October 1st.

South Fork Consolidated Mining Company.—The tunnel is in 300 ft., and a vein of ore has been followed all the way. A sample of the entire width of the vein assayed $13\frac{1}{4}$ per cent. lead and 12 ozs. silver.

Summit County.

Meears Mining Company.—Mr. Wm. Whitehall has filed suit against this company and against G. A. Meears, J. R. Walker et al., and asks for the recovery of 15,812 shares of stock.

Coal.

The Allen hollow mine, operated by the Chalk Creek Mining Company, will probably strike coal within a month. The shaft is now down about 250 ft. and cannot be far from the coal bed.

The Wilson Brothers have their mine in a condition to do some heavy shipping, and are finding a ready market for their coal. The new slope which they have been working on for several months is now nearly through. When through it will supply the mine with plenty of fresh air and enable them to more than double their output.

The Grass Creek mine has been shut down for several weeks, but has again begun operation with a new boiler, and everything in good shape for running all winter. Mr. Thomas says the coal he is now getting out of the vein is the best ever mined from the vein. Shipments are being made to Salt Lake and Park City.

The prospects for a large coal output from this camp this winter are better than in any previous season, says the Coalville "Chronicle." The new hoist at the Wasatch mine, which is expected to be in operation in a couple of months, denotes that the owners of this large mine have a ready market for additional coal in view, else they would not have gone to this expense. Coal has been shipped west this week from the Wasatch mine.

Tooele County.

Muldoon.—The main shaft is now down a depth of 150 ft. and at the bottom there is a large body of good ore. Five men are engaged in sinking the shaft. Notwithstanding the fact that no stoping is being done there has been considerable ore extracted during development work. The ore vein is from 2 to 4 ft. wide and is improving as depth is attained. At the Queen of Sheba in the same district a strike has been made in the main tunnel at a depth of 50 ft.

Third Term.—This mine is now being worked under lease by Cutler Bros. A trial shipment was made September 23d of 10 tons, which averaged 54% lead and 21 oz. silver. The ore is from a foot vein in a new shaft, 14 ft. below the surface. There is also 14 ft. of milling ore in the old workings, averaging 15% lead and some silver.

WASHINGTON.

Okanogan County.

Allison Group.—This group of claims is developing very satisfactorily to the owners. They propose thoroughly testing this property before putting on machinery, as some of the gold ores of this section are not entirely free milling, and consequently all new mills going into this country will have to be equipped with suitable process for working those ores that are refractory. They are now down some 50 ft., and will crosscut until they find the walls, and then drift both ways on the ledge. They will also sink on other ledges, and thoroughly prospect the property this season, with the view of erecting a mill next season.

Ruby.—A strike has been made about 200 ft. from the mouth of the tunnel, which has been run on the strike of the vein, and at a vertical depth of some 65 ft. from the surface. The vein being a large one, a crosscut was made, showing it to be some 18 ft. in thickness, 11 ft. of which is a good average grade ore, while the remaining 7 ft. is native silver, mixed with high grade sulphides.

Triune (near Loomiston).—The owners of this mine are erecting a ten stamp mill on their property. The ore is free milling gold quartz mostly, a small per cent. running to concentrates. The vein is a blanket vein, and assays about 17 per cent. to the ton. They claim at least a thousand tons of ore in sight.

WEST VIRGINIA.

Monongalia County.

Messrs. E. L. Parker & Co. have during the past two years succeeded in getting options on about 6,000 acres of coal lands in this county. These options were offered to a New York syndicate which has had an expert report on the property. It is reported that the Pennsylvania Railroad Company is interested in the deal.

FOREIGN MINING NEWS.

BRITISH COLUMBIA.

Mr. H. E. Parrish has returned from British Columbia from Graham Island of the Queen Charlotte Group, where he went to report upon the recent coal discoveries. He reports that the best seams of coal were found near Yakoun Lake. There are 9 seams of soft and three of anthracite coal. The

best vein was found just north of Yakoun Lake, another good one was found on the east of the lake, and the others were scattered throughout the property. The veins are from 7½ to 19 feet in depth, and about 14 miles long, the general dip being to the east. It is near the surface, and could be taken out with very little trouble or expense.

Kootenai.

P. J. Jennings, in an interview with the Spokane "Spokesman," says: "The new road from Kaslo to the Slocan employs regularly 40 or 50 men, and is being built at the rate of nearly a mile a day. Three miles are already finished. Business is lively at Kaslo, and the neighboring mines are in good condition. Considerable work will be done this winter. The Ajax and Crown Point have been bonded to Dr. Kilbourne, of Seattle, for \$15,000. He will also work the Lucky Jim all winter, as it is now paying well. Among the mines in which work will not stop are the Washington, which now has a 50 ft. tunnel on ore; Wardner's, where the vein varies from 20 to 36 in.; the Best, whose shaft has struck a 4-ft. bed of ore that is still widening; and the Noble Five. The Surprise has the tunnel driven 40 ft. and is now in a bed of ore having 3 ft. of \$220 galena and one of carbonate that has given \$334 to the ton."

Slocan.

(From our Special Correspondent.)

West Kootenai District—Not since the Coeur d'Alene excitement in 1883 has there been so great an interest taken in any one mining district as has been in and about Slocan the past season. A large amount of development work on the prospects made a year ago in this district has been done the past summer, and the expectations of the owners are more than realized. Mr. E. F. Steel, a mining expert of judgment, has spent the summer in the Slocan and has seen most of the locations, and says the work done on the claims show better than anticipated. Most of the claims in this district have ore enough on the dump to pay for all the work done over and above the expense of getting the ore out of the country to a smelter. Many of the mines have several thousand dollars' worth of ore on the dump waiting for the completion of the wagon road, contract for which has just been let. The road is some twenty miles long through heavy timber; the grade, however, is regular and quite easy. The contract price for building the road is \$23,000, and is to be completed in 60 days. The Wellington, Dardanelles, Freddy Lee, Blue Bird and others have yielded a large amount of ore and are making a good showing. On the Washington, which probably has done the most development work, a tunnel has been run some forty feet and a three foot bed of solid ore has been struck. The peculiarity of this ore is that it runs unusually high in silver. It carries a great deal of gray copper, and assays show it to run as high as 1,500 to 2,000 ounces in silver. Average run from 200 to 500 ounces of silver and from 50 to 70% lead. Many of the prospectors will wait until the wagon road is finished before doing much work. The cost at present to deliver ore to Kaslo on Kootenai Lake is 80c. per ton, which will be reduced to probably 15c. per ton by next spring with good communication by wagon road. The road will tap the prominent mines and will be connected by side roads of from two to five miles long, with every mine in the district. Mr. Steel says: "In all my 21 years' study of mines I have never seen such promising surface indications as in this Slocan district." Mr. James Wardner, one of the owners of the Freddy Lee and also one of the most energetic mine owners in this part of the country, does not propose to wait for the completion of the wagon road, but has just shipped 70 mules into the Slocan country to pack ore from his mine, which was located only three months ago. He already has 100 mules in service. Mining experts claim another year will show the Slocan to be the greatest silver-lead mining district in the world, both for quantity and quality.

COLOMBIA.

Department of Cauca.

The Panama "Star Herald" publishes an interview with Mr. Alfred S. Hodges, a civil and mining engineer of London, Eng., who has been engaged in mining enterprises in the Department of Cauca. In the Santander district of the department, and in a heavy mountain range varying from 4,000 to 6,000 ft. above the sea, existed a mine known in colonial times, but which at a more recent period became the property of the Mosquera family, by whom it was worked to great profit for some years. Large amounts of the gold coined in the mint at Palmira came from this mine, which has always been known as the "Ensolvado." During one of the civil wars work was suspended, and buildings and plant fell into decay. Recently, thorough exploration and survey by Mr. Hodges, for himself and associates, furnished convincing proof that there were prospects of profit in the undertaking. A company was formed in Cali with a capital of \$100,000, the old rights of the Mosquera estate purchased for \$60,000, and work was commenced with the remaining \$40,000, which have been judiciously expended in machinery and labor on the mine, which for over 8 months has been yielding fair returns. A 12-stamp mill has been erected, the mine opened, and about \$4,000 per month is now taken out, sufficient to pay all expenses and leave a satisfactory margin of profit. The veins which have been opened are some of many which exist in the neighborhood, contain free gold to a depth of over 180 ft., and in some places the quartz is of high

grade. Continued study and exploration convinced Mr. Hodges that the region was rich, and that much of the gold which existed in the placers in the valley streams was supplied from that section. Some of the veins examined showed that for some depth the quartz had been decomposed, and the gold they carried could be washed out of the pulverized mass without the necessity of crushing. The gold found in these peculiar pockets exists in pieces and fragments, some of which are of considerable size and value, and of all sorts of forms. In the neighborhood exist banks or deposits of considerable extent and depth, and these have been prospected in many places by means of shafts, revealing the fact that gold exists from grass roots to bed rock in quantities sufficient to justify hydraulic mining on an extensive scale. After thorough and patient investigation of the whole field involved, the directors of the "Ensolvado" Company determined to reorganize on a larger scale, or to form a new company with sufficient capital to work the newly discovered placers, and carry on quartz mining on the numerous veins on their property, on a more extensive scale. Mr. J. L. Cherry, who holds the concession for the Cauca Railroad, studied the field and the facts, and resolved to take an interest in the enterprise. Some Chicago men were enlisted in the scheme, the capital was guaranteed, and the result is the formation of the International Exploration Company of New York, with Mr. Cherry as president, and Mr. Hodges as vice-president and general manager. The old Cali organization and some Bogota houses have their part. The capital stock is \$500,000, and Mr. Hodges is now on his way to the United States to procure all the necessary machinery.

INDIA.

It is reported that pure alum in large quantities has been discovered in the Jurgoon mountains near Quetta.

MEXICO.

It is reported in the British papers that a syndicate of British and American capitalists has been formed for the purpose of buying the volcano Pocatepetl and working the sulphur formations in its crater. These continuous formations of sulphur have been worked to a small extent by the present owner of the volcano, General Sanchez Ochoa, but only as much sulphur was taken away as would supply the Mexican Army with gunpowder. The difficulty of transportation to and from the summit of the volcano, which is 17,784 feet above the sea level, is, of course, considerable, but the syndicate is intending to build an electric railway from the summit to Puebla, 35 miles to the northeast.

Lower California.

It is reported that new gold fields have been discovered at Agua D e. There are now 500 diggers on the ground.

San Luis Potosi.

The Candelaria de Pinos is reported in bonanza, and is said to be yielding ores averaging 1,120 oz. silver.

Sonora.

Charles J. Whimple and Thomas Burke are interested in the El Plomo mines in the Altar district, in Sonora. About 2,000 ft. of development work are completed. Three veins of ore average from 10 to 30 ft. wide and will yield \$50 in gold, silver and lead, gold predominating. A 40-ton smelter is now in transit for the mines, and it is expected that it will be turning out ore within 30 days. Messrs. Roberts and Grant are expected from New York early next month. The El Plomo mines are very promising properties and will soon be among the big producers of this part of the country.

NICARAGUA.

A correspondent from Greytown writes as follows to the Panama "Star and Herald": "Don Jose Aramburu, of Spain, is in this port. He has been engaged in mining in this country for some time past, and he has extracted large quantities of gold from washing in the river and from digging in the mines, and has added to his acquisitions the discovery of other quartz mines which promise to yield a considerable amount of gold. It appears that the best field is at the head of the Bambana and Yelura Rivers, Princepolka Main. There are also other mines at the Washook on the River Segovia. The Bambana is navigable for medium size boats carrying machinery in pieces as heavy as 1,500 lbs. weight, which can be taken to the mills. The mines are in a healthy region, the climate very bracing, and all that is wanted is science, energy and mining experience."

SOUTH AFRICA.

The diamonds found in the river diggings in Griqualand during the first six months of the year amounted to 30,966 carats, valued at £71,004. This gives an average value of £2 5s. 10d. per carat, and the quality is said to be better than that of those found in the mines. The number of miners working in this district is about 2,000, and by figuring it out, it will be seen that their average earnings is only £6 per month. They are a very contented set of people, however, and their only desire is that they and their trade shall be left in peace.

WALES.

Since 1845 fifty-three colliery explosions, including that of Park Slip, have occurred in South Wales and Monmouthshire, and the list of deaths has reached the extraordinary number of 2,154. Of this total, 266 persons were killed in 1890.

MINING STOCKS.

[For complete quotations of shares listed in New York, Boston, San Francisco, Aspen, Colo.; Baltimore, Pittsburg, Deadwood, S. Dak.; St. Louis, Helena, Mont.; London and Paris, see pages 382 and 384.]

NEW YORK, Friday Evening, Oct. 14.

The discovery of America by Columbus in 1492 is to blame for the lack of interest in mining stocks displayed this week. The Consolidated Stock and Petroleum Exchange was gaily decorated in honor of the event, but the "mining crowd" looked as listless and forlorn as ever. Evidently they had nothing to celebrate for. The holidays, on Wednesday naturally interfered with business, and it gave a good excuse to the optimistic brokers who, from time immemorial, have been predicting the return of the old time activity in mining stock circles.

The Comstocks have held their own somewhat better than was anticipated. At the close to-day, especially, prices were fairly firm and some business was done. Belcher sold at \$4, but only one sale is reported, and that was of but 100 shares. There was a sale of Comstock Tunnel bonds, 2,000 at 19, and another of 100 shares of the stock at 13c. In another column will be found an account of the annual meeting of the Comstock Tunnel Company. Consolidated California & Virginia was in better demand and 600 shares changed hands at \$3.75@4.50. Crowa Point declined from \$1.60 to \$1.35; total sales 300 shares. Of Gould & Curry 300 shares were sold at \$1.40@ \$1.50, and an equal number of Hale & Norcross were disposed of at \$2.25@2.40. Other sales were as follows: 100 shares of Sierra Nevada at \$2.25; 600 shares of East Sierra Nevada at 10c.; 200 shares of Best & Belcher at \$2.25@2.35; 300 shares of Yellow Jacket at \$1.30@1.70; 100 shares of Choliar at \$1.10; 400 shares of Julia at 15c.; 300 shares of Mexican at \$2@2.30; 100 shares of Potosi at \$1.10; 500 shares of Scorpion at 30c.@35c. In our mining news columns will be found the monthly statements of the various Comstock companies showing their financial condition on October 1st.

Of the Tuscarora stocks we note sales of 500 shares of Belle Isle at 15c. and of 400 shares of Navajo at 15@16c.

The California stocks were rather quiet during the week. Bulwer shows sales of 200 shares at 34c. Of Mono 300 shares changed hands at 40c. (assessment paid). There was a solitary sale of 100 shares of Standard Consolidated at \$1.35. The total transaction in Brunswick Consolidated aggregated 8,100 shares, at 9@10c.

The following letter from the superintendent, dated October 6th, has been received at this company's office in this city: For the past week all the work done at this mine has been of a preparatory character for deep sinking of the shaft. The tank station has been cut, the tank put in and all the water cut off from the 600-ft. level. Tomorrow the 4-in. pump will be put in to keep the bottom of the shaft dry. It will greatly facilitate the work. A contract has been let for running the two drifts for 100 ft. at \$4.75 per foot. Another contract has been let for the shaft at \$14 per foot. The ledge in the east drift is 22 ft. wide; the west drift remains as per last report. The ore is good milling. The work will be pushed as fast as possible. Mr. H. R. Lounsbury, treasurer of this company, has received a map showing the underground working of the Brunswick mine up to date. Stockholders are invited to inspect it.

One of the largest stockholders of the Plymouth Consolidated Mining Company has gone to the mine to investigate certain matters of importance. After his return to this city the long promised meeting of the Board of Directors will be held.

The Colorado stocks were quiet this week. Of Chrysolite only 100 shares were sold at 22c. Sales of Robinson Consolidated amounted to 400 shares at 33c. The only other Colorado stock dealt in during the week was Small Hopes, of which 100 shares were sold at 95c. to \$1.

Alice shows a sale of 100 shares at 50c. Horn Silver was quiet this week; 150 shares were sold at \$3.65 to \$3.70.

Boston.

Oct. 13.

(From our Special Correspondent.)

There has been a good market the past week for copper stocks, and with the increasing activity we note a substantial advance in prices for the leading stocks, and although the advance has not been fully sustained, there is no doubt there is a better feeling and more disposition to buy stocks than has been noted for many months. There is said to be a large short interest in Boston and Montana, and the effort to cover has no doubt contributed largely to the advance in this stock, which at one time sold as high as \$37. With the elimination of this element the stock declined to \$34.75, and the transactions have fallen off to mere nominal dealings. The strength of ingot copper, both at home and abroad, has contributed largely to the speculative element, and a lively market for the whole list is predicted the balance of the year.

Calumet & Hecla came in for its share of the advance, and sold up to \$295, losing only \$1 in the reaction.

Butte & Boston continues to be firm at 9½ to 9¾, with only limited dealings.

Tamarack advanced from \$158 to \$162, the latest sale being \$161.

Osceola has been in good demand all the week, and the transactions in this stock have been quite large, although the price has not materially advanced. It sold at one time as high as 35¾, but

NEW YORK MINING STOCKS QUOTATIONS.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table of New York Mining Stocks Quotations, divided into Dividend-paying and Non-dividend-paying mines. Columns include Name and Location of Company, dates from Oct. 8 to Oct. 14, and Sales figures.

*Ex-dividend. +Dealt at in New York Stock Ex. Unlisted securities. †Assessment paid. ‡Assessment unpaid. Dividend shares sold, 7,550. Non-dividend shares sold, 9,800. Total shares sold, 17,350. | Holiday.

BOSTON MINING STOCK QUOTATIONS.

Table of Boston Mining Stock Quotations, listing company names, dates from Oct. 7 to Oct. 13, and sales figures.

Dividend shares sold, 20,533. Non-dividend shares sold, 7,957. Total shares sold, 28,490.

DIVIDEND-PAYING MINES.

NON-DIVIDEND PAYING MINES.

Detailed table of mining stock data, split into Dividend-paying and Non-dividend-paying sections. Columns include Name and Location of Company, Capital Stock, Shares, Assessments, Dividends, and various financial metrics.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table with columns: Name and Location of Company, Capital Stock, Shares (No., Par), Assessments (Total Levied, Date and amount of last), Dividends (Total paid, Date and amount of last), Name and Location of Company, Capital Stock, Shares (No., Par), Assessments (Total levied, Date and amount of last).

G., Gold. S., Silver. L., Lead. C., Copper. B., Borax. * Non-assessable. † This company, as the Western, up to December 10th, 1881, paid \$1,400,000. ‡ Non-assessable for three years. § The Deadwood previously paid \$275,000 in eleven dividends and the Terra \$75,000. ¶ Previous to the consolidation in August, 1884, the California had paid \$31,320,000 in dividends, and the Cons. Virginia \$42,90,000. ** Previous to the consolidation of the Copper Queen with the Atlanta, August, 1885, the Copper Queen had paid \$1,350,000 in dividends. †† This company paid \$190,000 before the reorganization in 1880. ††† This company acquired the property of the Raymond & Kly Company which had paid \$3,075,000 in dividends. †††† Previous to this company's acquiring Northern Belle, that mine declared \$2,400,000 in dividends against \$425,000 in assessments.

STOCK MARKET QUOTATIONS.

Table with columns: Company, Bid, Asked. Includes entries for Aspen, Oct. 8, and Baltimore, Md., Oct. 13.

Table with columns: Company, Bid, Asked. Includes entries for Baltimore, Md., Oct. 13, and Pittsburgh, Pa.

Table with columns: Company, H., L. Includes entries for Pittsburgh, Pa., and St. Louis, Oct. 12.

Table with columns: Bid, Asked. Includes entries for St. Louis, Oct. 12.

Table with columns: Bid, Asked. Includes entries for Helena, Mont., and Helena, Mont. (Special report by SAMUEL K. DAVIS).

Foreign Quotations.

Table with columns: Location, Highest, Lowest. Includes entries for London, Oct. 1, and Paris, Sept. 29.

Table with columns: Location, Francs. Includes entries for Paris, Sept. 29.

Table with columns: Name of Stock, Oct. 7, Oct. 8, Oct. 10, Oct. 11, Oct. 12, Oct. 13, Oct. 14. Includes entries for San Francisco, Cal.

CURRENT PRICES.

Large table listing various chemical and industrial products and their prices. Includes entries for acids, alkalis, oils, and minerals.

Table listing various minerals and their prices. Includes entries for Warble Dust, Metallic Paint, and various ores.

THE RARE METALS.

Table listing rare metals and their prices. Includes entries for Aluminum, Arsenic, Barium, Bismuth, Cadmium, etc.

COAL STOCKS.

Table with columns: Name of Company, Oct. 8, Oct. 10, Oct. 11, Oct. 12*, Oct. 13, Oct. 14, Sales. Includes entries for various coal companies.